ABUNDANCE, AGE, SEX AND SIZE STATISTICS FOR PACIFIC HERRING IN THE TOGIAK DISTRICT OF BRISTOL BAY, 2002

By

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ABSTRACT

The Pacific herring *Clupea pallasi* total run in the Togiak District of Bristol Bay was monitored for abundance/biomass and sampled for age, size, and sex in 2002. Department staff estimated abundance from aerial surveys with chartered aircraft. Commercial catch samples came from purse seine and gillnet landings. During closed fishing periods, herring samples were obtained from test fish purse seine catches made by volunteers from the commercial fleet. A total of 7,129 herring were sampled from 3-14 May 2002. Scales for aging, along with sex, length, weight and sexual maturity information were collected. Herring age varied from 4 to 20 years in the sample. Samples collected from non-selective gear were predominately age-5, -6 and -9, while samples collected from the gillnet fishery were primarily age-8 through -11. Mean length and weight of individuals captured from the purse seine fishery were 274 mm and 291 grams, while fish sampled from the gillnet fishery averaged 304 mm and 407 grams. Total harvest from the purse fishery was 11,833 tons and total harvest from the gillnet fishery was 5,216 tons. No total run biomass estimate was calculated in 2002 because of poor aerial survey conditions.

KEY WORDS: Pacific herring, *Clupea pallasi*, sac roe, spawning biomass, commercial herring fishery, Bristol Bay, Togiak District, age, length, weight, sex

INTRODUCTION

Pacific herring *Clupea pallasi* are harvested in several spawning locations along the eastern Bering Sea coast from Norton Sound south to Port Moller. The Togiak District of Bristol Bay supports the largest discrete spawning biomass of Pacific herring in Alaskan waters. Biomass estimates based on aerial surveys have been conducted since 1978 and have ranged from 76,960 tons[1] (69,818 tonnes[2]) in 1980 to 242,298 tons (219,811 tonnes) in 1979 (Table 1). From 1992 through 2001, the total run biomass has averaged 149,373 tons (135,510 tonnes).

Herring spawn within the Togiak District from late April through May. After spawning, herring leave the fishing district and migrate south in a clockwise movement along the Alaska Peninsula to feeding areas near Unalaska Island. In August and September, these fish move to overwintering grounds near the Pribilof Islands (Shaboneev 1965, Rumyantsev and Darda 1970; Wespestad and Barton 1981; Funk 1990; Figure 1).

The largest fishery for Togiak herring occurs during their inshore spawning period. The most valuable product from this harvest is the ripened ovaries, or egg skeins, referred to as sac roe. This product is primarily marketed in Japan. Commercial harvest of herring for sac roe was first documented in the Togiak District in 1968. Passage of the Fisheries Conservation and Management Act in 1976 and the resulting inability of Japanese fishers to harvest sac roe from U.S. waters prompted increased interest in the Togiak fishery by U.S. fishers. The twenty-year annual harvest has averaged 20,708 tons (18,786 tonnes). The greatest harvest of 30,315 tons (27,502 tonnes) occurred during the 1994 season (Table 1).

Herring spawn on brown algae *Fucus sp*, commonly known as rockweed, is also harvested within the Togiak District. This wild spawn-on-kelp product is harvested either by hand or rake. The harvest, documented since 1967, has been intermittent in recent years because of low demand with no fishery occurring during the 1997, 1998, 2000 and 2001 seasons (Table 1). The twenty-year annual harvest has averaged 187 tons (170 tonnes).

During their post spawning migration, Togiak herring are susceptible to other fisheries. A directed food/bait fishery occurs during mid-to-late summer months in the Unalaska Island area. Catches were first documented on these feeding herring in 1929. Harvests reached a maximum of 3,006 tons (2,727 tonnes) in 1932. The fishery declined and ended completely by 1938 because of poor market demand, but was renewed in 1981. The annual harvest since 1982 has averaged 2,409 tons (2,185 tonnes; Table 1).

Incidental harvest of Togiak herring occurs as bycatch in fisheries targeting groundfish in the southeastern Bering Sea. Foreign vessels first exploited these groundfish fisheries but domestic

[1] The Alaska Board of Fisheries requires that inseason catch and aerial survey biomass estimates be calculated and reported in short tons. The English short ton = 2,000 lb or 907.2 kg.

[2] The metric tonne = 1,000 kg or 2,205 lbs: The conversion is tonnes (t) = tons/1.1023

fishers have recently dominated. These fisheries often occur along the migratory route of feeding herring (Funk 1990; Rowell et al. 1991). The additional harvest upon a fully exploited herring population has been a concern brought before the North Pacific Management Council and the Alaska Board of Fisheries by western Alaskan fishermen.

Togiak herring have been managed as a single spawning population distinct from others in the Bering Sea. A maximum regulatory exploitation rate of 20% of the spawning biomass has been established in the Bristol Bay Herring Management Plan, 5AAC 27.865 (ADF&G 2002). This plan provides an allocation of 1,500 tons (1,361 tonnes) to the wild spawn-on-kelp fishery and 7% of the remaining harvest (after subtraction of the spawn-on-kelp harvest) for the Dutch Harbor food/bait fishery. The rest of the harvestable surplus is reserved for the sac roe fishery: 30% for gillnet and 70% for the purse seine fleet.

Stock assessment studies of the Togiak herring population began in 1976 and have continued annually since 1978 (McBride et al. 1981; McBride and Whitmore 1981; Fried et al. 1982a, 1982b, 1983a, 1983b, and 1984; Lebida et al. 1985a, 1985b; Lebida 1987; Sandone and Brannian 1988; Lebida and Sandone 1990, Rowell 1995, 2002a, 2002b, West 2002). An annual objective is to document the age, size and sex composition, as well as maturity of the commercial harvest, and to estimate run biomass and the spawning escapement of herring in the Togiak District. These data provide the basis for development of population and forecasting models used to determine harvest strategies.

METHODS

Study Area

Togiak District is one of five fishing districts within Bristol Bay Management Area 'T'. The district consists of all state waters between the longitude of the tip of Cape Constantine and the longitude of the tip of Cape Newenham, a linear distance of approximately 193.2 km (Figure 2). Because of its large size, the Togiak Fishing District is divided into six management sections: Kulukak, Nunavachak, Togiak, Hagemeister, Pyrite Point and Cape Newenham.

A wide intertidal zone and several shallow bays characterize the shoreline. Diurnal tidal range may reach 4.6 m (Selkregg 1976). The primary marine vegetation in the Togiak District consists of ribbon kelp *Laminaria spp*, rockweed *Fucus spp,* and eelgrass *Zostera spp.* The spawn-on-wild kelp fishery has focused on harvest of rockweed primarily in the Togiak, Nunavachak and Kulukak Sections. Herring have spawned throughout the fishing district, particularly in areas where eelgrass and rockweed have been present. Rockweed is the most visible species of aquatic vegetation because it grows on cobble substrate in intertidal areas and upon rocky outcroppings.

Age, Size and Sex Data

Data Collection

Pacific herring were collected from management sections within the fishing district during fishery openings and closures. Herring were sampled at the close of each commercial fishing period from tenders or individual fishing vessels for each gear type and fishing section. Attempts were made to collect samples from several vessels to ensure multiple schools were represented. During closed fishing periods, volunteer commercial fishers made test purse seine sets to capture herring for sampling roe content. Samples were also collected for age, sex and length information from these sets.

A scale for age determination was removed from the left side of each fish from approximately 2.5 cm behind the operculum and 2.5 cm below the lateral line. If scales were absent from this preferred area, a scale was removed from the right side of the fish in the same location, or anywhere a readable scale was present. Removed scales were dipped in 10% mucilage solution, mounted sculptured side up on glass slides, and read by annuli interpretation using a microfiche reader. Scales were aged by counting the annuli formed at the end of winter prior to spawning (Shaboneev 1965). This timing was coincidental to the collection of samples in the spawning migration; thus, the outer edge of the scale was counted as an annulus.

Standard length from the snout to the hypural plate at the base of the tail was measured to the nearest millimeter. Each herring was weighed to the nearest gram.

Sex and gonad maturity was determined for each herring by examination of the gonads or sex products. Maturity of both male and female herring was rated by the eight-scale guideline outlined in Barton and Steinhoff (1980). These categories were combined and summarized as green, ripe or spent.

Sample Sizes

The desired sample size of a multinomial population would result in an estimate that would simultaneously fall within 5% (α =0.05) of the true population age proportions 95% of the time (Thompson 1987). A sample size of 400 herring would guarantee this level of precision for the number of age classes represented with consideration of 10 age classes (ages 3-12). Sample sizes required to represent the biomass from test purse seines were 400 fish per 3-day strata or 134 fish per day based on the time required to collect and process the herring. Time strata for the commercial purse seine harvest were 400 herring per day, area, and gear type. Time strata for the commercial gillnet harvest were 150 herring per day, area, and gear type.

Age, Weight and Length Data

Age composition of the commercial harvest was estimated from herring collected from the commercial and test fisheries throughout the Togiak District. The percent age composition by number, for each age class P_a, was estimated for each gear-time-area stratum from both fishery and non-fishery samples:

$$P_a = \frac{n_a}{n}, \tag{1}$$

where:

n_a = the number of herring in the sample that were age a and

n = the total number of herring in the sample.

The mean weight-at-age, W_a, for herring was estimated for each gear-time-fishery stratum by

$$\overline{W}_a = \frac{\sum_{i=1}^{n_a} W_{ai}}{n_a}, \tag{2}$$

where:

W_{ai} = equals the individual weight of herring in sample n that were age a.

The mean length-at-age was calculated by substituting the individual length L_{ai} of herring for the individual weight W_{ai}.

Commercial Harvest

Fish tickets (sales receipts) were completed by processing companies and buyers for each commercial delivery of herring. Estimates of waste or discarded herring were obtained from aerial survey estimates of discarded herring or processor reports. Estimated waste was included in the fish ticket database and used in the calculation of exploitation rates.

Age composition, by weight, of the commercial harvest was estimated by

$$B_a = \left[\frac{n_a \overline{W}_a}{\sum_{a=1}^{\max_a} (n_a \overline{W}_a)} \right] B, \qquad (3)$$

where:

B_a = equals the harvest for age a,

n_a = equals the number of herring in the sample that were age a,

$\overline{W}_a$ = equals the mean weight for herring of age a, and

B = the total estimated harvest expressed as biomass or daily biomass estimate.

Age composition of the waste, or deadloss, (i.e. herring that were caught but not sold) was represented by the age composition for the same gear type in the commercial fishery.

The number of fish for each age class, N_a, was then calculated by

$$N_a = \frac{B_a}{\overline{W}_a}. \qquad (4)$$

The migration of herring between management sections within the Togiak District is not well understood. Residence time of herring within the district and rate of turnover for the biomass on the grounds is unknown. Age information from the herring samples collected by nonselective gear were pooled across management sections to determine any temporal trends in age composition, which would indicate immigration of new herring or emigration of spent herring from the fishing district.

Biomass Estimation

The run biomass for the Togiak District was estimated using aerial survey assessment procedures outlined by Lebida and Whitmore (1985). When weather permitted, aerial surveys were flown daily at low tide to estimate herring abundance. Each management section was divided into index areas to facilitate survey documentation. Aerial survey estimates for each index area were summed to provide biomass estimates for each management section by day. Biomass estimates of these management sections were then summed to provide the observed district-wide biomass for each day.

RESULTS

Commercial Harvest

A commercial harvest of 17,049 tons (15,466 tonnes) occurred within the Togiak District for a sac roe product. Commercial openings were from 3-13 May, and test purse seine fisheries occurred on 13 and 14 May (Table 2). Age composition of the total harvest can be seen in Table 3 and Figure 3. Average roe percentages of all harvested herring was 9.4%.

Biological information was collected from 7,129 herring caught by purse seine and gillnet gear in the Togiak Fishing District from 3-14 May 2002. Regenerated or illegible scales composed 6.2% of all scale samples (Table 4). The percentage of unreadable scales from commercial gillnet samples was 7.7%, followed by commercial purse seine (6.0%) and test purse seine (4.8%).

Purse Seine

There were 15 commercial purse seine openings in the Togiak District from 3-13 May totaling 57.5 hours (Table 2). A total of 11,833 tons (10,735 tonnes) of herring were harvested, which includes 243 tons (220 tonnes) from test fish sets that occurred shortly after the commercial fishery and 40 tons (36 tonnes) of estimated deadloss. Catches from Hagemeister Section accounted for 71% of the total purse seine harvest, followed in magnitude by Nunavachak (25%), Pyrite Point (2%), Togiak (1%) and Kulukak Sections (< 1%) (Table 2; Figure 4). Row percentages averaged 9.3% from the purse seine harvested herring.

Herring sampled from the purse seine fishery ranged from age-4 to age-18 (Table 5). Age groups 5, 6 and 9 were the major age classes comprising 25%, 28% and 15% of the commercial purse seine harvest by weight and 35%, 31%, and 10% by number (Table 3; Figure 5; Appendix A.1). Mean weight of herring in the harvest was 291 g and mean length was 274 mm (Table 5). Mean weights by age class of herring captured in the purse seine fishery are in Appendix B1-B.4.

A temporal change in age class structure of the biomass was evident in the age composition of herring captured with purse seine. A shift from older to younger herring was first observed on the east side of the district in Nunavachak Section (Table 6; Figure 6; Appendix A.1). Samples collected from 3-5 May indicated an older age composition with age-9 and older herring comprising 41% of the sample, but by sample period 6-8 May, age-9 and older herring composition decreased to 10%. Conversely, age-4, -5 and -6 herring increased from 50% during the 3-5 May sampling period to 84% during the 6-8 May sampling period. Herring age-7 and -8 also decreased from 9% during the 3-5 May sampling period to 4% during the 6-8 May sampling period. A similar trend occurred on the west side of Togiak District (Hagemeister and Pyrite Point Sections) during periods in which sufficient samples were collected (Table 6; Figure 6; Appendix A.1). For sample periods 6-8 May, 9-11 May and 12-14 May, age-9 and older composition changed from 32% to 28% to 13%,

respectively. Conversely, proportions of herring samples ages-4, -5 and -6 increased from 59% to 62% to 83% during the same sample periods. Herring composition of ages-7 and -8 changed from 9% to 11% to 5% during the same respective time periods.

Sex composition varied over time, but overall sex composition of all aged samples from the commercial purse seine fishery was 49% female (Appendix B.1-B.4).

Gillnet

Ten commercial gillnet openings totaling 102 hours occurred from 4-13 May harvesting a total of 5,216 tons (4,732 tonnes), all of which came from Kulukak Section (Table 2). Harvest was bimodal with the first peak occurring on 7 May (975 tons (885 tonnes)) and the second occurring on 11 May (1,222 tons (1,109 tonnes)). Row percentage from these fish averaged 10.9%.

Age composition of the samples collected from the gillnet fishery ranged from age-5 to age-20 (Table 5). Herring age-9 and older composed 78% of the gillnet harvest by weight and 74% by number (Table 3; Figure 5; Appendix A.2). Contribution of herring age-6 and younger was minimal, representing 5% by weight and 6% by number. Mean weight of herring in the commercial gillnet harvest was 407 g and mean length was 304 mm (Table 5). Mean weight by age class of herring captured in the gillnet fishery are in Appendix B.5.

Sex composition varied over time, but overall sex composition of all aged samples from the gillnet fishery was 53% female (Appendix B.5).

Spawn on Kelp

The spawn on kelp fishery was conducted for a two-hour period on the evening of 14 May. The opening resulted in 50 deliveries that amounted to 67,793 pounds, an equivalent of 260 tons (236 tonnes) of biomass (Table 1). Department staff observed approximately 65 participants collecting kelp.

Biomass Estimation

Herring were observed in the Togiak Fishing District from 2 May through 4 June (Table 7). No fish were observed on 23 April, 26 April or 1 May with poor-to-fair survey conditions. The first substantial biomass of 10,850 tons (9,843 tonnes) was documented in the Nushagak, Metervik, Nunavachak and Togiak Sections on 2 May. A total of 37,707 tons (34,208 tonnes) were observed on 3 May and most of the fish were observed in Kulukak, Metervik and Nunavachak Sections. Since the minimum threshold biomass of 35,000 tons (31,752 tonnes) was reached (ADF&G 2002), fishing commenced the next day. Poor survey conditions prevailed the next seven days, but

improved on 11 May when a peak biomass of 45,100 tons (40,914 tonnes) was observed (Table 7). A total of 43,100 tons (39,100 tonnes) were observed the following day and 39,200 tons (35,562 tonnes) were observed on 15 May. Inclement weather prevented an accurate survey on 25 May, but a survey flown on 4 June had good-to-fair survey conditions with 2,900 tons (2,631 tonnes) of biomass observed.

No total run biomass estimate could reliably be derived from the aerial surveys. Prolonged inclement weather from 4-10 May made it too difficult to make an accurate estimation.

Approximately 3.7 km (2.3 miles) of linear spawn was first observed on 2 May. Peak spawn was observed on 12 May when 14.3 km (8.9 miles) of linear spawn was observed. A total of 51.4 km (31.9 miles) of spawn was observed from 2 May through 4 June.

DISCUSSION

The 2002 sac roe harvest was the lowest since 1991. The preseason forecast allowed for a harvestable level of 20,961 tons (19,016 tonnes; ADF&G 2002; Appendix C). The 2002 harvest was 19% below this guideline. The main reasons for this were a combination of reduced effort and poor weather conditions associated with the 2002 season. Despite multiple extensions to the fishery openings, harvest levels remained low during the bulk of the run. When weather conditions improved, small fish comprised the majority of the harvest resulting in a fishery closure to conserve the young fish.

Of the years in which a spawn-on-kelp fishery was conducted, the 2002 harvest was the lowest since 1973 (Table 1). This was attributed to a weak demand for the product. Only one company bought the product with a goal of purchasing 60,000 pounds.

Since total run biomass could not be estimated in 2002, age composition of the purse seine harvest was the best indication of age structure in the total run, and was compared to the preseason forecast (Table 3; Appendix C). A few disparities exist between the 2002 total run forecast and what was captured in the 2002 purse seine fishery. The main difference was with the composition of age-4 and -5 herring. By number of fish, 13% of the total run was forecasted to be age-4, but only 2% of the purse seine harvest was age-4 (Table 3; Appendix B). Age-5 fish were forecasted to comprise 15% of the total run by numbers of fish, but actually comprised 35% of the purse seine harvest. All the other age class proportions were similar to what was forecasted (Table 3; Appendix B). It is unclear if the high proportion of age-5 fish in the purse seine fishery is truly indicative of the total run. Since age composition decreases over time, the timing of the harvest could influence these results. For example, if the fishery harvested more fish in the latter half of the run, a higher proportion of younger fish would show up in the harvest.

The average weight, by age class, was higher than the forecast across all age classes (Table 5; Appendix B). Disparities were highest in older aged fish. Several factors could have influenced this:

(1) higher than expected growth, (2) aging error and (3) total run and harvest timing.

Based on the purse seine harvest, it appears the offspring of 1997 brood year (age-5) fish had good recruitment, which supplemented the strong age classes of 1996 (age-6) and 1993 (age-9) (Figure 7). These three age classes comprised 76% of the purse seine harvest by number of fish and 68% by weight.

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Table 1. Historical total run biomass and commercial harvests (tons) of Pacific herring returning to the Togiak District, Bristol Bay, 1968-2002.

Year	Total Run Biomass (tons) [a,g]	Togiak Sac Roe Harvest (tons) [c]	Spawn-on-Kelp			Dutch Harbor Food and Bait Harvest (tons) [e]
			Harvest (lbs) [c]	Harvest (tons) [c]	Herring Equivalent (tons) [d]	
1968		80				
1969		47	10,125	5		
1970		28	38,855	19		
1971		[f]	51,795	26		
1972		80	64,165	32		
1973		51	11,596	6		
1974		123	125,646	63		
1975		56	111,087	56		
1976		[f]	295,780	148		
1977		2,795	275,774	138		
1978	191,537	7,734	329,858	165		
1979	242,297	11,558	414,727	207		
1980	76,960	24,516	189,662	95		
1981	158,860	12,489	378,207	189		704
1982	98,022	21,821	234,924	117		3,565
1983	141,053	26,786	274,866	137		3,567
1984	113,471	19,419	406,587	203	1,552	3,578
1985	132,420	25,812	[f]	[f]	[f]	3,480
1986	94,390	16,276	374,142	187	1,446	2,394
1987	89,086	15,530	307,307	154	1,309	2,503
1988	134,717	14,168	489,400	245	1,782	2,004
1989	98,965	12,258	559,754	280	2,499	3,081
1990	88,105	12,230	413,844	207	1,617	820
1991	83,229	14,970	348,357	174	1,310	1,325
1992	156,955	25,807	363,600	182	1,482	1,949
1993	193,847	17,956	383,000	192	1,481	2,790
1994	185,454	30,315	308,400	154	1,134	3,349
1995	149,093 [g]	26,732	281,600	141	996	1,748
1996	135,585 [g]	24,871	455,800	228	1,899	2,239
1997	144,887	23,813	[f]	[f]	[f]	1,950
1998	121,000 [g]	22,776	[f]	[f]	[f]	1,994
1999	157,026	19,878	419,563	210	1,605	2,398
2000	130,904 [g]	20,421	[f]	[f]	[f]	2,014
2001	146,209	22,330	[f]	[f]	[f]	1,439
1982-01 Mean [h]	129,721	20,708	374,743	187	1,547	2,409
1992-01 Mean [i]	152,096	23,490	368,661	184	1,433	2,187
2002	120,196 [g]	17,049	67,793	34	260	2,751

[a] Data not available prior to 1978

[b] Source: ADF&G (2002)

[c] Source : ADF&G (1988; 1968-79); Sandone and Brannian (1988; 1980-1987); fish ticket receipts, 1988-2002.

[d] Management plan adopted by Board of Fisheries in 1984 setting a 350,000 lb. harvest guideline, specifying 2 to 3 year rotation, and including spawn-on-kelp (S-O-K) herring equivalent in exploitation rate. Herring equivalent calculation reported in ADF&G (1997).

[e] Source: ADF&G (2002); catches documented since 1929. Fishery did not occur between 1946 and 1980.

[f] No fishery conducted

[g] Aerial surveys to determine abundance were hampered by poor weather conditions preventing calculation of a final seasons biomass estimate. Inseason management used preseason forecast.

[h] The 1982-2001 calculated mean for S-O-K fishery does not include years 1985, 1997,1998, 2000 and 2001 and the the calculated mean harvest for the Dutch Harbor food and bait fishery does not include 1979 and 1980.

[i] The 1992-2001 calculated mean for the S-O-K fishery does not include years 1997,1998, 2000 and 2001.

Table 2. Commercial herring harvest (tons) by fishing section, gear type and date, Togiak District, Bristol Bay, 2002. Roe percentages are displayed in parenthesis.

Date	Duration (hh:mm)	Periods	Kulukak		Nunavachak		Togiak		Hagemeister		Pyrite Point		Newenham	Total	Roe %
							Purse Seine								
3-May	0:30	1												0	
4-May	3:00	2,3	29.1	(9.7)	672	(8.7)								701	(8.74)
5-May	6:00	4,5			1179	(9.27)			76	(8.7)				1,254	(9.24)
6-May	6:00	6,7			420	(8.68)			1,150	(8.38)	52	(6.1)		1,622	(8.39)
7-May	10:00	8			101	(9.7)	103	(7.4)	1,352	(9.3)	52	(9.4)		1,609	(9.21)
8-May	13:00	9			390	(9.6) "	6	(10.8)	1,228	(9.2)				1,623	(9.30)
9-May	8:00	10							1,827	(10.3)				1,827	(10.30)
10-May	4:00	11							1,190	(10.2)	89	(10.4)		1,279	(10.21)
11-May	2:00	12							747	(9.0)	100	(10.5)		848	(9.18)
12-May	3:00	13,14					32	(8.0)	481	(8.95)				513	(8.89)
13-May	2:00	15	45	(10.7) *	144	(8.0) *			315	(7.6)				504	(7.99)
14-May									54	(10.58) *				54	(10.58)
Subtotal	57:30		74	(10.31)	2,905	(9.05)	141	(7.7)	8,419	(9.40)	293	(9.5)		11,833	(9.30)
							Gillnet								
4-May	4:00	1	224	(10.00)										224	(10.00)
5-May	4:00	2	240	(10.00)										240	(10.00)
6-May	8:00	3	547	(12.10)										547	(12.10)
7-May	12:00	4	975	(11.00)										975	(11.00)
8-May	8:00	5	368	(10.30)										368	(10.30)
9-May	14:00	6	110	(11.40)										110	(11.40)
10-May	14:00	7	939	(11.00)										939	(11.00)
11-May	14:00	8	1,222	(10.80)										1,222	(10.80)
12-May	12:00	9	478	(10.20)										478	(10.20)
13-May	12:00	10	113	(10.10)										113	(10.10)
Subtotal	102:00		5,216	(10.90)										5,216	(10.90)
							Combined								
3-May														-	
4-May			253	(9.97)	672	(8.7)								925	(9.05)
5-May			240	(10.00)	1,179	(9.28)			76	(8.7)				1,494	(9.37)
6-May			547	(12.1)	420	(8.69)			1,150	(8.38)	52	(6.1)		2,169	(9.32)
7-May			975	(11.0)	101	(9.07)	103	(7.4)	1,352	(9.3)	52	(9.4)		2,584	(9.88)
8-May			368	(10.3)	390	(9.6) "	6	(10.8)	1,228	(9.2)				1,992	(9.48)
9-May			110	(11.4)					1,827	(10.3)				1,937	(10.53)
10-May			939	(11.0)					1,190	(10.2)	89	(10.4)		2,217	(10.55)
11-May			1,222	(10.8)					747	(9.0)	100	(10.5)		2,069	(10.14)
12-May			478	(10.2)			32	(8.0)	481	(8.95)				991	(9.52)
13-May			158	(10.37) *	144	(8.0)			315	(7.6)				617	(8.54)
14-May									54	(10.58) *				54	(10.07)
Total			5,290	(10.84)	2,906	(9.03)	141	(7.68)	8,419	(9.40)	293	(9.5)		17,049	(9.39)

* Includes test fish harvest which is conducted during closed commercial periods.
" Includes 40 tons documented waste.

Table 3. Harvest information from the herring sac roe fishery, Togiak District, 2002.

Age	Purse Seine				Gillnet				Total Harvest			
	Biomass ST	Percent by Wt	Number (x 1,000)	Percent by No.	Biomass ST	Percent by Wt	Number (x 1,000)	Percent by No.	Biomass ST	Percent by Wt	Number (x 1,000)	Percent by No.
1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
4	145	1.2	753	2.0	0	0.0	0	0.0	145	0.8	753	1.5
5	2,975	25.1	12,873	34.6	22	0.4	90	0.8	2,996	17.6	12,963	26.4
6	3,324	28.1	11,611	31.2	233	4.5	718	6.1	3,557	20.9	12,329	25.1
7	519	4.4	1,502	4.0	242	4.6	686	5.8	761	4.5	2,188	4.5
8	633	5.4	1,601	4.3	657	12.6	1,604	13.5	1,290	7.6	3,206	6.5
9	1,727	14.6	3,864	10.4	1,938	37.2	4,338	36.6	3,665	21.5	8,202	16.7
10	767	6.5	1,625	4.4	848	16.3	1,807	15.2	1,615	9.5	3,432	7.0
11	637	5.4	1,296	3.5	578	11.1	1,207	10.2	1,214	7.1	2,503	5.1
12	484	4.1	946	2.5	345	6.6	704	5.9	829	4.9	1,650	3.4
13	286	2.4	548	1.5	143	2.7	290	2.4	429	2.5	837	1.7
14	186	1.6	349	0.9	152	2.9	297	2.5	339	2.0	646	1.3
15	107	0.9	195	0.5	35	0.7	70	0.6	142	0.8	265	0.5
16	26	0.2	46	0.1	13	0.2	21	0.2	39	0.2	67	0.1
17	15	0.1	26	0.1	0	0.0	0	0.0	15	0.1	26	0.1
18	3	0.0	4	0.0	0	0.0	0	0.0	3	0.0	4	0.0
19	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
20	0	0.0	0	0.0	10	0.2	18	0.1	10	0.1	18	0.0
Total	11,833	100.0	37,239	100.0	5,216	100.0	11,851	100.0	17,049	100.0	49,090	100.0

Table 4. Number of samples collected by gear type during the 2002 Togiak herring season.

Gear Type	Number of Readable Scale Samples	Number of Unreadable Scale Sampes	Total	% Unreadable Scale Samples
Commercial Purse Seine	5,066	324	5,390	6.0
Commercial Gillnet	1,167	97	1,264	7.7
Test Commercial Purse Seine	452	23	475	4.8
Total	6,685	444	7,129	6.2

Table 5. Mean length (mm), weight (g) and standard deviation, by age, for herring represenative of the commercial harvest by gear type, Togiak District, 2002.

Commercial Purse Seine						Commercial Gillnet					
Age	Number of Samples	Mean Length (mm)	SD	Mean Weight (g)	SD	Age	Number of Samples	Mean Length (mm)	SD	Mean Weight (g)	SD
4	92	237	6.3	172	18.9	4	0	0	-	0	-
5	1,676	251	8.3	209	25.5	5	8	255	7.4	225	24.3
6	1,620	267	9.2	259	31.2	6	54	275	9.2	298	32.4
7	194	280	9.5	306	37.8	7	60	283	8.3	327	31.9
8	212	293	9.2	362	47.3	8	153	296	8.3	375	35.0
9	561	305	8.5	407	45.1	9	430	304	8.4	410	36.6
10	234	310	8.0	430	45.5	10	188	310	8.0	428	40.1
11	184	316	8.5	447	51.2	11	126	314	9.7	438	40.9
12	126	320	9.2	465	53.4	12	73	319	9.0	450	45.2
13	78	322	9.4	475	50.0	13	32	318	11.8	457	56.0
14	50	325	8.1	494	61.4	14	32	323	9.6	470	46.8
15	26	330	9.2	498	54.3	15	7	325	5.8	447	30.0
16	9	334	10.6	519	52.3	16	3	329	13.7	547	22.5
17	3	335	12.1	534	17.4	17	0	0	-	0	-
18	1	348	0.0	604	0.0	18	0	0	-	0	-
19	0	0	-	0	-	19	0	0	-	0	-
20	0	0	-	0	-	20	1	342	-	532	-
All Samples Combined	5,066	274	26.0	291	97.9		1,167	304	14.7	407	56.9

Table 6. Temporal change in age composition (by number) of samples collected from non-selective gear, Togiak District, 2002.

Date	Sample Size	Percent by Age Group				
		4	5-6	7-8	9	10+
Nunavakchak Section						
5/3-5/5	806	0.5	49.1	9.2	16.9	24.3
5/6-5/8	968	2.8	82.6	4.3	5.6	4.7
5/9-5/11 [a]						
5/12-5/14 [a]						
Total	1,774					
Hagemeister and Pyrite Point Sections						
5/3-5/5	197	6.6	62.9	10.2	10.7	9.6
5/6-5/8	1,258	1.5	57.4	9.1	13.8	18.1
5/9-5/11	1,123	1.6	60.1	10.8	11.0	16.5
5/12-5/14	714	1.5	81.1	4.8	7.3	5.3
Total	3,292					

[a] Unable to obtain samples from these openings

Table 7. Daily observed biomass estimates (tons) of herring by index area, Togiak District, 2002.

Date	Start Time (hh:mm)	Survey Rating[a]	Km of Spawn	Estimated Biomass by Index Area[b]													Daily Total
				NUS	KUK	MET	NUN	UGL	TOG	TNG	MTG	OSK	PYP	CN	HAG	WAL	
23-Apr	15:25	3.1															
26-Apr	10:42	3.4															
1-May	10:20	4.5															
2-May	12:30	2.4	3.7	4,937		348	511	1,173	3,883								10,851
3-May	9:20	3.4			46	12	611	80		30	164	425					1,369
3-May	17:40	2.6	9.0	80	11,832	8,803	6,176	380	8,334	757	1,345						37,707
8-May	13:45	[c]	1.6														
10-May	10:40	3.7	6.2		146	684		856		300	1,478	2,700					6,163
11-May	9:50	1.8	11.1		5,423	8,479	534	4,013	4,057	8,942	9,452	705	1,583	142	1,838		45,167
12-May	11:32	1.5	14.3	2,891	4,286	7,067	3,168	417	16,784	5,991	1,150				1,391		43,145
15-May	10:35	1.1	0.8	1,608	4,267	3,989	3,071	423	10,418	2,880	2,034	1,229	34		9,272		39,225
25-May	11:40	4.4	2.3		359		254		134						145		891
4-Jun	10:00	2.7	2.4	1		1,116	1,364	262			149						2,892
Total		2.9	51.4													PEAK	45,167

[a] 1= Excellent, 2 = Good, 3 = Fair, 4 = Poor, 5 = Unsatisfactory

[b] Index areas: NUS - Nushagak Peninsula; KUK - Kulukak; MET - Metervik; NVK - Nunavachak; UGL - Ungalikthluk; Togiak; TOG - Togiak; TNG - Tongue Pt; MTG - Matogak; HAG - Hagemeister; OSK - Osvisak; PYP - Pyrite Point; CN - Cape Newenham.

[c] Vessel count and spawn survey only

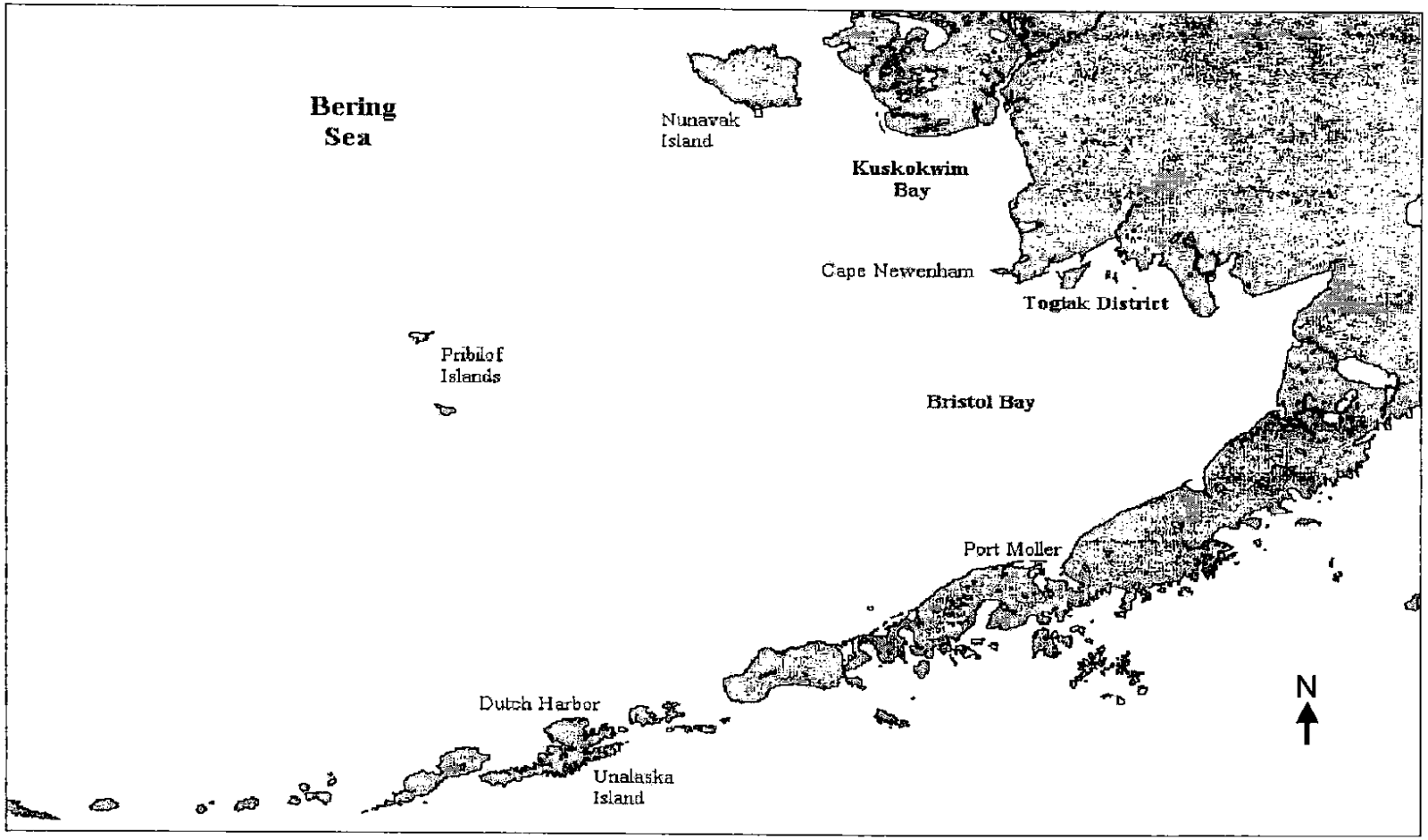

Figure 1. Map of southeastern Bering Sea.

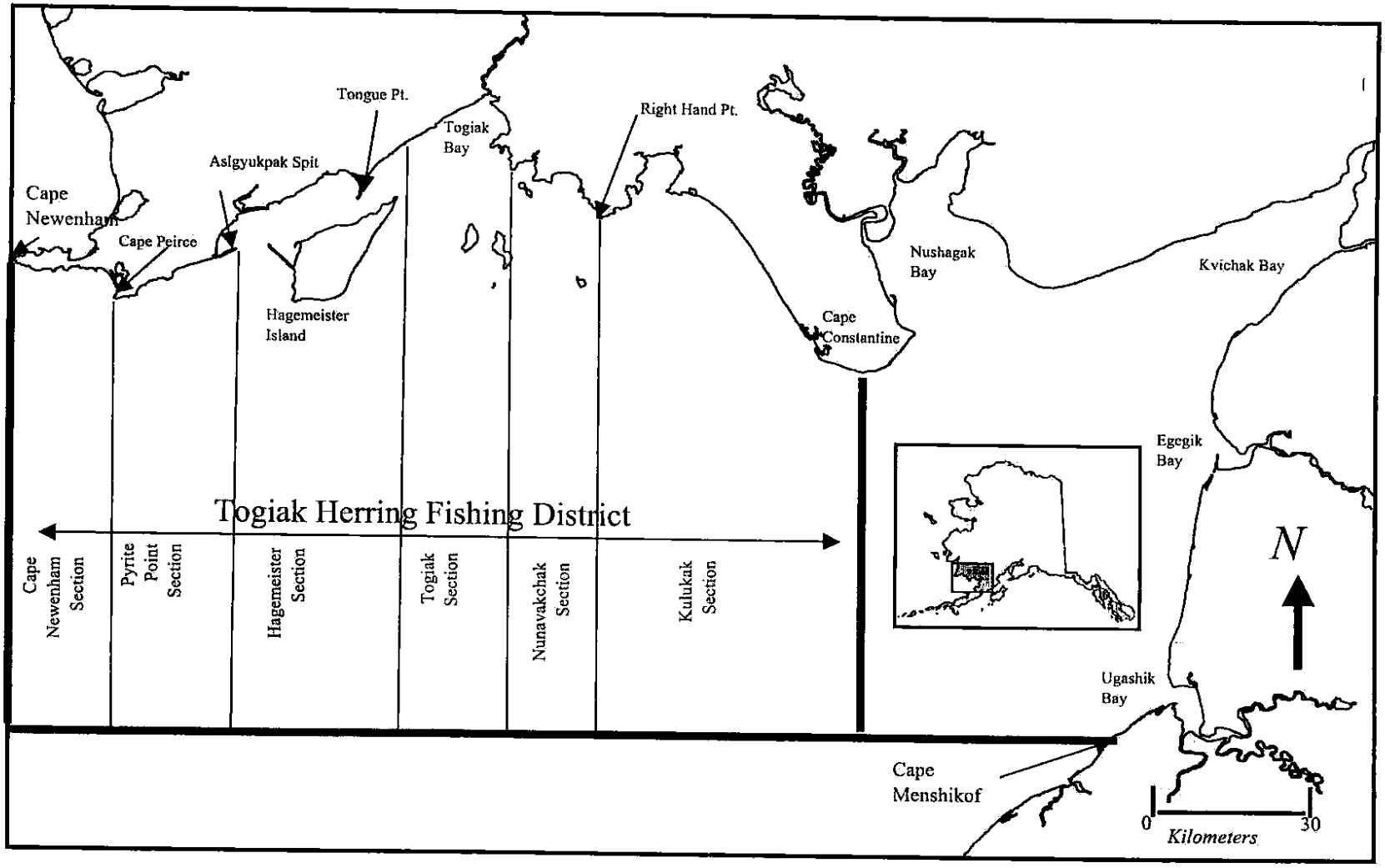

Figure 2. Map of Togiak Herring District, Bristol Bay.

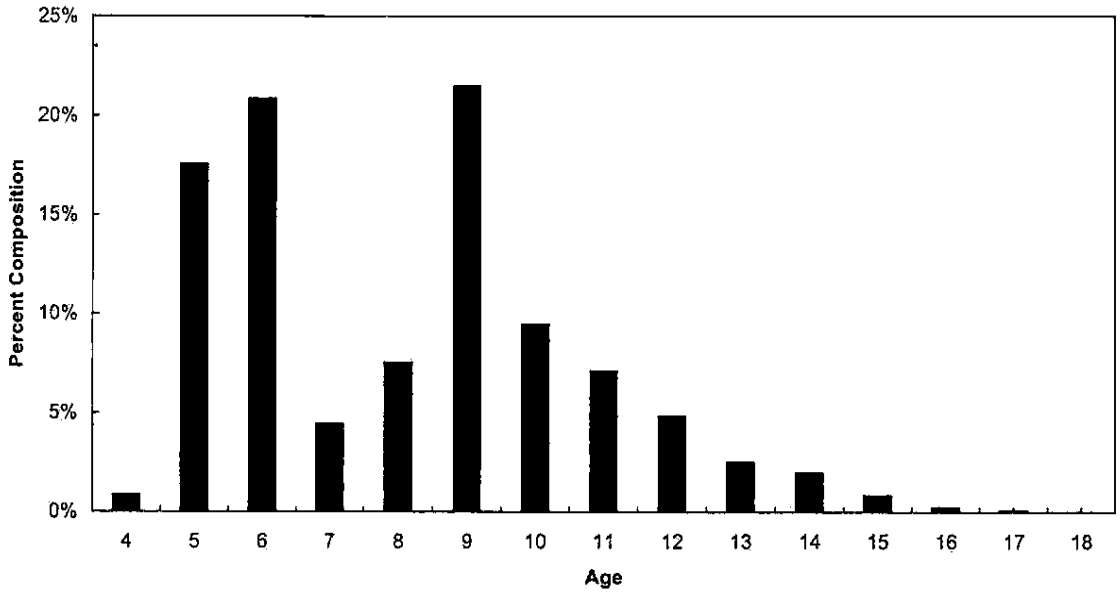

Figure 3. Age composition of the total herring harvest, Togiak District, 2002.

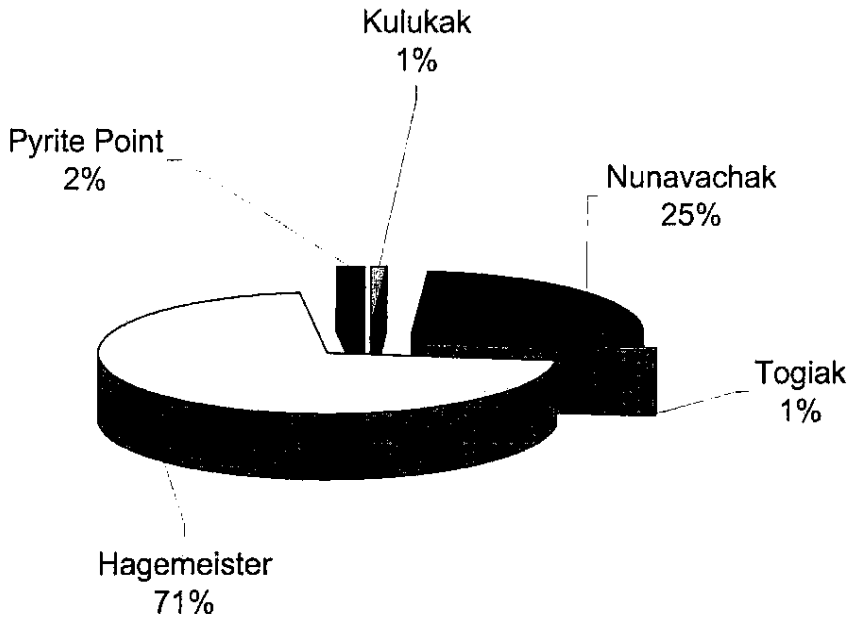

Figure 4. Commercial purse seine harvest distribution by fishing section, Togiak District, 2002.

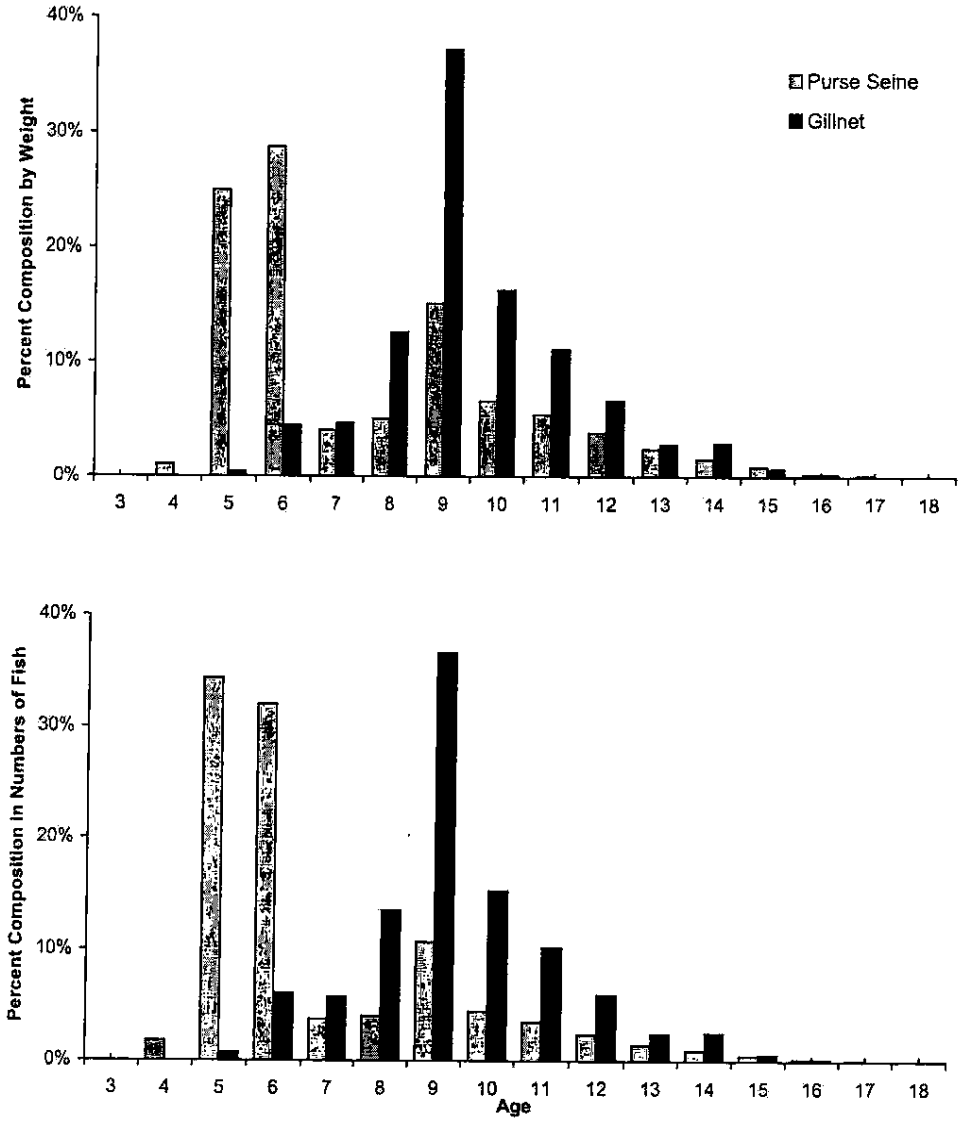

Figure 5. Percent age composition of the commercial harvest by weight (top) and in numbers of fish (bottom), Togiak District, 2002.

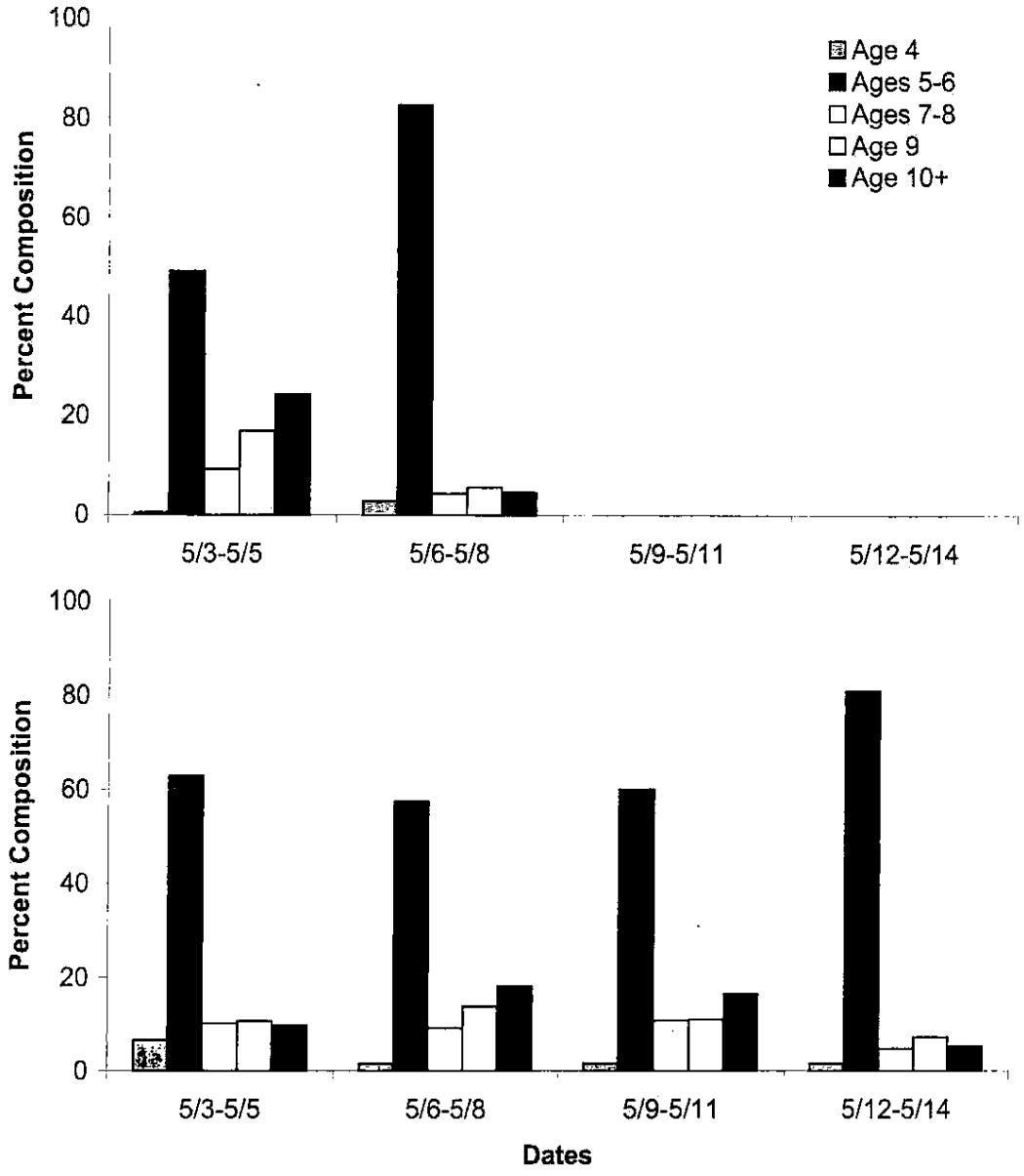

Figure 6. Age composition of herring samples collected with non-selective gear by sampling period, east Togiak District (Nunavachak Section (top)) and west Togiak District (Hagemeister and Pyrite Point Sections (bottom)), 2002.

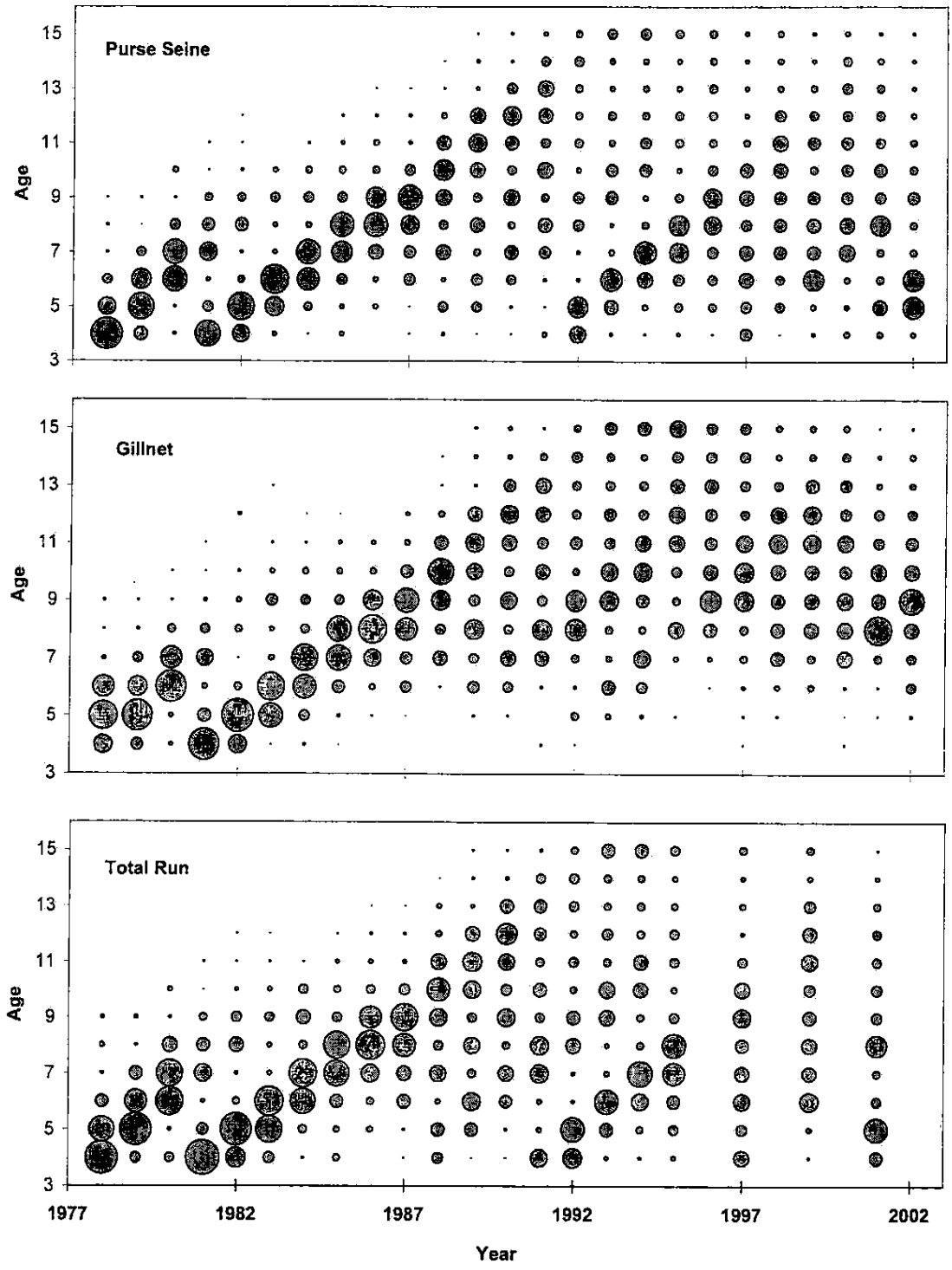

Figure 7. Historical age composition (diameter of the circles represent percent age composition, determined by number of fish) of the purse seine harvest, gillnet harvest and total run, Togiak District, Bristol Bay.

Appendix A.1. Age composition apportionment of the commercial purse seine harvest weighted by harvest biomass (tons), by date and fishing section, Togiak District, 2002.

Sample Date(s): 5/3 - 5/4
Section(s): Nvk, Kul
Harvest biomass: 701 (tons)

Age	No. of Samples	Percent by No.	No. of fish (x1,000)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	1	0.2	4
5	23	5.3	88
6	98	22.7	374
7	18	4.2	69
8	29	6.7	111
9	97	22.5	370
10	45	10.4	172
11	46	10.7	176
12	30	7.0	115
13	20	4.6	76
14	14	3.2	53
15	7	1.6	27
16	3	0.7	11
17	0	0.0	0
18	0	0.0	0
Total	431	100.0	1,646

Age	Weight	Percent by Weight	Biomass (tons)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	199	0.1	1
5	5,406	3.2	23
6	26,796	16.1	113
7	5,532	3.3	23
8	11,122	6.7	47
9	41,292	24.8	174
10	19,500	11.7	82
11	20,700	12.4	87
12	14,270	8.6	60
13	9,537	5.7	40
14	6,923	4.2	29
15	3,591	2.2	15
16	1,635	1.0	7
17	0	0.0	0
18	0	0.0	0
Total	166,503	100.0	701

Sample Date(s): 5/5
Section(s): Nvk, Hag
Harvest biomass: 1,254 (tons)

Age	No. of Samples	Percent by No.	No. of fish (x1,000)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	16	2.8	114
5	180	31.5	1,285
6	219	38.3	1,563
7	24	4.2	171
8	23	4.0	164
9	60	10.5	428
10	17	3.0	121
11	16	2.8	114
12	3	0.5	21
13	6	1.0	43
14	5	0.9	36
15	3	0.5	21
16	0	0.0	0
17	0	0.0	0
18	0	0.0	0
Total	572	100.0	4,083

Age	Weight	Percent by Weight	Biomass (tons)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	2,758	1.7	22
5	38,154	23.9	300
6	56,373	35.4	444
7	7,350	4.6	58
8	8,397	5.3	66
9	23,931	15.0	188
10	7,433	4.7	58
11	6,912	4.3	54
12	1,460	0.9	11
13	2,648	1.7	21
14	2,456	1.5	19
15	1,497	0.9	12
16	0	0.0	0
17	0	0.0	0
18	0	0.0	0
Total	159,369	1.0	1,254

Sample Date(s): 5/6
Section(s): Nvk, Hag, Pyp
Harvest biomass: 1,622 (tons)

Age	No. of Samples	Percent by No.	No. of fish (x1,000)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	12	1.1	53
5	367	32.4	1,612
6	376	33.2	1,652
7	33	2.9	145
8	42	3.7	184
9	139	12.3	611
10	64	5.6	281
11	37	3.3	163
12	27	2.4	119
13	19	1.7	83
14	11	1.0	48
15	4	0.4	18
16	0	0.0	0
17	1	0.1	4
18	1	0.1	4
Total	1,133	100.0	4,977

Age	Weight	Percent by Weight	Biomass (tons)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	2,022	0.6	10
5	77,719	23.2	376
6	97,547	29.1	472
7	10,173	3.0	49
8	15,372	4.6	74
9	56,908	17.0	276
10	28,093	8.4	136
11	17,235	5.1	83
12	12,260	3.7	59
13	9,069	2.7	44
14	5,415	1.6	26
15	2,048	0.6	10
16	0	0.0	0
17	514	0.2	2
18	604	0.2	3
Total	334,979	100.0	1,622

Sample Date(s): 5/7
Section(s): Nvk, Hag, Pyp, Tog
Harvest biomass: 1,609 (tons)

Age	No. of Samples	Percent by No.	No. of fish (x1,000)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	17	3.0	165
5	241	41.9	2,344
6	202	35.1	1,965
7	15	2.6	146
8	18	3.1	175
9	45	7.8	438
10	10	1.7	97
11	12	2.1	117
12	7	1.2	68
13	4	0.7	39
14	1	0.2	10
15	2	0.3	19
16	1	0.2	10
17	0	0.0	0
18	0	0.0	0
Total	575	100.0	5,593

Age	Weight	Percent by Weight	Biomass (tons)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	2,912	1.9	31
5	49,887	33.2	535
6	52,043	34.7	558
7	4,461	3.0	48
8	6,240	4.2	67
9	18,109	12.1	194
10	4,114	2.7	44
11	5,460	3.6	59
12	3,053	2.0	33
13	1,825	1.2	20
14	432	0.3	5
15	1,002	0.7	11
16	529	0.4	6
17	0	0.0	0
18	0	0.0	0
Total	150,067	100.0	1,609

Appendix A.1. (page 2 of 3)

Sample Date(s): 5/8
Section(s): Nvk, Hag, Tog
Harvest biomass: 1,623 (tons)

Age	No. of Samples	Percent by No.	No. of fish (x1,000)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	17	3.3	167
5	185	35.7	1,869
6	151	29.2	1,524
7	26	5.0	254
8	23	4.4	221
9	44	8.5	439
10	27	5.2	269
11	16	3.1	163
12	16	3.1	150
13	5	1.0	48
14	4	0.8	32
15	3	0.6	34
16	1	0.2	9
17	0	0.0	0
18	0	0.0	0
Total	518	100.0	5,172

Age	Weight	Percent by Weight	Biomass (tons)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	2,912	2.0	33
5	38,295	26.4	429
6	38,903	26.8	436
7	7,732	5.3	87
8	7,973	5.5	89
9	17,707	12.2	198
10	11,108	7.7	124
11	7,280	5.0	82
12	6,978	4.8	78
13	2,281	1.6	26
14	1,728	1.2	19
15	1,503	1.0	17
16	529	0.4	6
17	0	0.0	0
18	0	0.0	0
Total	144,930	100.0	1,623

Sample Date(s): 5/9
Section(s): Hag
Harvest biomass: 1,827 (tons)

Age	No. of Samples	Percent by No.	No. of fish (x1,000)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	6	1.6	89
5	115	31.6	1,710
6	85	23.4	1,264
7	18	4.9	268
8	23	6.3	342
9	41	11.3	610
10	19	5.2	282
11	19	5.2	282
12	19	5.2	282
13	9	2.5	134
14	6	1.6	89
15	3	0.8	45
16	0	0.0	0
17	1	0.3	15
18	0	0.0	0
Total	364	100.0	5,412

Age	Weight	Percent by Weight	Biomass (tons)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	1,092	1.0	18
5	23,805	21.4	390
6	22,355	20.1	366
7	5,670	5.1	93
8	7,659	6.9	126
9	16,605	14.9	272
10	7,885	7.1	129
11	8,170	7.3	134
12	8,873	8.0	145
13	4,329	3.9	71
14	2,880	2.6	47
15	1,608	1.4	26
16	0	0.0	0
17	546	0.5	9
18	0	0.0	0
Total	111,477	100.0	1,827

Sample Date(s): 5/10
Section(s): Hag, Pyp
Harvest biomass: 1,279 (tons)

Age	No. of Samples	Percent by No.	No. of fish (x1,000)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	5	1.3	52
5	117	31.1	1,213
6	107	28.5	1,109
7	20	5.3	207
8	19	5.1	197
9	41	10.9	425
10	24	6.4	249
11	16	4.3	166
12	10	2.7	104
13	8	2.1	83
14	6	1.6	62
15	2	0.5	21
16	1	0.3	10
17	0	0.0	0
18	0	0.0	0
Total	376	100.0	3,898

Age	Weight	Percent by Weight	Biomass (tons)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	825	0.7	9
5	24,336	21.7	278
6	27,392	24.5	313
7	6,340	5.7	72
8	7,011	6.3	80
9	16,031	14.3	183
10	10,128	9.0	116
11	7,120	6.4	81
12	4,530	4.0	52
13	3,784	3.4	43
14	2,982	2.7	34
15	986	0.9	11
16	462	0.4	5
17	0	0.0	0
18	0	0.0	0
Total	111,927	100.0	1,279

Sample Date(s): 5/11
Section(s): Hag, Pyp
Harvest biomass: 848 (tons)

Age	No. of Samples	Percent by No.	No. of fish (x1,000)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	7	1.8	46
5	128	33.4	846
6	123	32.1	813
7	21	5.5	139
8	20	5.2	132
9	42	11.0	277
10	14	3.7	92
11	10	2.6	66
12	10	2.6	66
13	3	0.8	20
14	2	0.5	13
15	0	0.0	0
16	2	0.5	0
17	1	0.3	7
18	0	0.0	0
Total	383	100.0	2,517

Age	Weight	Percent by Weight	Biomass (tons)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	1,295	1.1	9
5	29,496	25.3	215
6	34,533	29.7	251
7	7,735	6.6	56
8	7,710	6.6	56
9	17,589	15.1	128
10	6,307	5.4	46
11	4,647	4.0	34
12	4,634	4.0	34
13	1,422	1.2	10
14	533	0.5	4
15	0	0.0	0
16	0	0.0	0
17	542	0.5	4
18	0	0.0	0
Total	116,443	1.0	848

Appendix A.1. (page 3 of 3)

Sample Date(s): 5/12
Section(s): Hag, Tog
Harvest biomass: 513 (tons)

Age	No. of Samples	Percent by No.	No. of fish (x1,000)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	8	2.3	42
5	161	46.8	845
6	99	28.8	519
7	12	3.5	63
8	9	2.6	47
9	34	9.9	178
10	8	2.3	42
11	3	0.9	16
12	2	0.6	10
13	4	1.2	21
14	1	0.3	5
15	2	0.6	10
16	1	0.3	5
17	0	0.0	0
18	0	0.0	0
Total	344	100.0	1,805

Age	Weight	Percent by Weight	Biomass (tons)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	1,376	1.6	8
5	33,327	37.6	193
6	25,146	28.3	145
7	3,276	3.7	19
8	2,997	3.4	17
9	13,362	15.1	77
10	3,344	3.8	19
11	1,215	1.4	7
12	960	1.1	6
13	1,984	2.2	11
14	447	0.5	3
15	870	1.0	5
16	411	0.5	2
17	0	0.0	0
18	0	0.0	0
Total	88,715	100.0	513

Sample Date(s): 5/13 - 5/14
Section(s): Hag, Nvk, Kul
Harvest biomass: 554 (tons)

Age	No. of Samples	Percent by No.	No. of fish (x1,000)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	6	0.9	20
5	314	49.7	1,062
6	245	38.8	828
7	12	1.9	41
8	8	1.3	27
9	26	4.1	88
10	8	1.3	27
11	10	1.6	34
12	3	0.5	10
13	0	0.0	0
14	0	0.0	0
15	0	0.0	0
16	0	0.0	0
17	0	0.0	0
18	0	0.0	0
Total	632	100.0	2,137

Age	Weight	Percent by Weight	Biomass (tons)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	973	0.6	4
5	63,280	42.3	236
6	60,516	40.4	226
7	3,623	2.4	14
8	2,884	1.9	11
9	9,824	6.6	37
10	3,068	2.0	11
11	4,117	2.7	15
12	1,434	1.0	5
13	0	0.0	0
14	0	0.0	0
15	0	0.0	0
16	0	0.0	0
17	0	0.0	0
18	0	0.0	0
Total	149,719	100.0	558

Sample Date(s): 5/3 - 5/14
Section(s): Nvk, Hag, Pyp, Tog, Kul
Harvest biomass: 11,833 (tons)

Age	No. of Samples	Percent by No.	No. of fish (x1,000)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	95	2.0	753
5	1,831	34.6	12,873
6	1,705	31.2	11,611
7	199	4.0	1,502
8	214	4.3	1,601
9	569	10.4	3,864
10	236	4.4	1,625
11	185	3.5	1,296
12	127	2.5	946
13	78	1.5	548
14	50	0.9	349
15	26	0.5	195
16	9	0.1	46
17	3	0.1	26
18	1	0.0	4
Total	5,328	100.0	37,239

Age	Weight	Percent by Weight	Biomass (tons)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	16,364	1.2	145
5	383,705	25.1	2,975
6	441,604	28.1	3,324
7	61,892	4.4	519
8	77,365	5.4	633
9	231,358	14.6	1,727
10	100,980	6.5	767
11	82,856	5.4	637
12	58,452	4.1	484
13	36,879	2.4	286
14	23,796	1.6	186
15	13,105	0.9	107
16	3,566	0.2	26
17	1,602	0.1	15
18	604	0.0	3
Total	1,534,129	100.0	11,833

Appendix A.2. Age composition apportionment of the commecial gillnet harvest weighted by harvest biomass (tons), by date and fishing section, Togiak District, 2002.

Sample Date(s): 5/4 - 5/6
Section(s): Kulukak
Harvest biomass: 1,011 (tons)

Age	No. of Samples	Percent by No.	No. of fish (x1,000)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	0	0.0	0
5	1	0.3	5
6	8	2.0	44
7	17	4.3	93
8	50	12.7	274
9	140	35.6	768
10	69	17.6	378
11	50	12.7	274
12	28	7.1	154
13	13	3.3	71
14	14	3.6	77
15	2	0.5	11
16	1	0.3	5
17	0	0.0	0
18	0	0.0	0
19	0	0.0	0
20	0	0.0	0
Total	393	1.0	2,155

Age	Weight	Percent by Weight	Biomass (tons)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	0	0.0	0
5	254	0.2	2
6	2,492	1.5	15
7	5,771	3.5	35
8	19,454	11.6	118
9	59,860	35.8	362
10	30,258	18.1	183
11	22,275	13.3	135
12	12,810	7.7	77
13	6,108	3.7	37
14	6,562	3.9	40
15	863	0.5	5
16	560	0.3	3
17	0	0.0	0
18	0	0.0	0
19	0	0.0	0
20	0	0.0	0
Total	167,267	100.0	1,011

Sample Dates: 5/7 - 5/9
Section(s): Kulukak
Harvest biomass: 1,453 (tons)

Age	No. of Samples	Percent by No.	No. of fish (x1,000)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	0	0.0	0
5	4	1.0	32
6	14	3.4	112
7	17	4.2	135
8	50	12.3	398
9	159	39.1	1,267
10	69	17.0	550
11	42	10.3	335
12	25	6.1	199
13	12	2.9	96
14	10	2.5	80
15	3	0.7	24
16	2	0.5	16
17	0	0.0	0
18	0	0.0	0
19	0	0.0	0
20	0	0.0	0
Total	407	100.0	3,242

Age	Weight	Percent by Weight	Biomass (tons)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	0	0.0	0
5	932	0.6	8
6	4,324	2.6	38
7	5,777	3.5	51
8	18,566	11.2	163
9	64,453	38.9	566
10	28,976	17.5	254
11	18,232	11.0	160
12	11,361	6.9	100
13	5,525	3.3	49
14	4,922	3.0	43
15	1,331	0.8	12
16	1,081	0.7	9
17	0	0.0	0
18	0	0.0	0
19	0	0.0	0
20	0	0.0	0
Total	165,480	100.0	1,453

Sample Dates: 5/10 - 5/14
Section(s): Kulukak
Harvest biomass: 2,752 (tons)

Age	No. of Samples	Percent by No.	No. of fish (x1,000)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	0	0.0	0
5	3	0.8	53
6	32	8.7	563
7	26	7.1	457
8	53	14.4	932
9	131	35.7	2,304
10	50	13.6	879
11	34	9.3	598
12	20	5.4	352
13	7	1.9	123
14	8	2.2	141
15	2	0.5	35
16	0	0.0	0
17	0	0.0	0
18	0	0.0	0
19	0	0.0	0
20	1	0.3	18
Total	367	100.0	6,454

Age	Weight	Percent by Weight	Biomass (tons)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	0	0.0	0
5	615	0.4	12
6	9,291	6.5	180
7	8,086	5.7	157
8	19,413	13.7	376
9	52,105	36.7	1,010
10	21,173	14.9	410
11	14,600	10.3	283
12	8,656	6.1	168
13	2,992	2.1	58
14	3,572	2.5	69
15	934	0.7	18
16	0	0.0	0
17	0	0.0	0
18	0	0.0	0
19	0	0.0	0
20	532	0.4	10
Total	141,437	100.0	2,752

Sample Dates: 5/4 - 5/14
Section(s): Kulukak
Harvest biomass: 5,216 (tons)

Age	No. of Samples	Percent by No.	No. of fish (x1,000)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	0	0.0	0
5	8	0.8	90
6	54	6.1	718
7	60	5.8	686
8	153	13.5	1,604
9	430	36.6	4,338
10	188	15.2	1,807
11	126	10.2	1,207
12	73	5.9	704
13	32	2.4	290
14	32	2.5	297
15	7	0.6	70
16	3	0.2	21
17	0	0.0	0
18	0	0.0	0
19	0	0.0	0
20	1	0.1	18
Total	1,167	100.0	11,851

Age	Weight	Percent by Weight	Biomass (tons)
1	0	0.0	0
2	0	0.0	0
3	0	0.0	0
4	0	0.0	0
5	1,801	0.4	22
6	16,107	4.5	233
7	19,634	4.6	242
8	57,433	12.6	657
9	176,418	37.2	1,938
10	80,407	16.3	848
11	55,107	11.1	578
12	32,827	6.6	345
13	14,625	2.7	143
14	15,056	2.9	152
15	3,128	0.7	35
16	1,641	0.2	13
17	0	0.0	0
18	0	0.0	0
19	0	0.0	0
20	532	0.2	10
Total	474,716	100.0	5,216

Appendix B.1. Age, sex and size composition of Pacific herring caught by commercial purse seine, Nunavachak Section, 3-8 May 2002.

Sample Dates	Age	Sex (number)				Percent of Total	Weight			Length		
		Male	Female	Unknown	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
	4											
	5	13	6	0	19	6.4	230	20.0	19	259	5.7	19
	6	44	37	0	81	27.2	271	25.8	81	272	9.1	81
	7	4	8	0	12	4.0	310	28.5	12	283	5.7	12
	8	9	10	0	19	6.4	388	32.3	19	300	7.6	19
	9	33	34	0	67	22.5	426	42.4	67	308	8.2	67
3-May	10	19	11	0	30	10.1	424	52.2	30	312	10.0	30
	11	17	14.0	0	31	10.4	465	48.1	31	319	8.0	31
	12	7	13	0	20	6.7	489	37.8	20	326	7.5	20
	13	3	4	0	7	2.3	471	57.1	7	322	12.7	7
	14	4	3	0	7	2.3	479	30.2	7	329	7.8	7
	15	2	2	0	4	1.3	540	45.4	4	335	8.2	4
	16	0	1	0	1	0.3	565		1	352		1
	17											
Sample Total		155	143	0	298	100.0	377	96.9	298	298	23.6	298
	4	0	1	0	1	0.8	199		1	242		1
	5	3	1	0	4	3.0	259	35.1	4	260	10.0	4
	6	10	7	0	17	12.8	285	20.6	17	270	6.4	17
	7	4	2	0	6	4.5	302	23.7	6	277	7.2	6
	8	8	2	0	10	7.5	375	35.0	10	290	7.2	10
	9	13	17	0	30	22.6	425	37.2	30	304	7.3	30
4-May	10	6	9	0	15	11.3	452	50.0	15	308	9.7	15
	11	11	4	0	15	11.3	419	65.7	15	310	9.6	15
	12	6	4	0	10	7.5	449	64.1	10	319	10.1	10
	13	4	9	0	13	9.8	480	41.0	13	319	10.6	13
	14	1	6	0	7	5.3	510	70.6	7	323	6.3	7
	15	3	0	0	3	2.3	477	45.9	3	328	6.2	3
	16	0	2	0	2	1.5	535	10.6	2	332	4.2	2
	17											
Sample Total		69	64	0	133	100.0	408	85.2	133	301	20.8	133
	4	2	1	0	3	0.8	161	11.6	3	237	3.2	3
	5	69	53	0	122	32.5	211	26.3	122	254	8.2	122
	6	85	68	0	153	40.8	255	30.7	153	269	8.4	153
	7	8	7	0	15	4.0	289	38.3	15	279	8.9	15
	8	5	7	0	12	3.2	356	63.5	12	295	14.5	12
	9	20	19	0	39	10.4	402	40.8	39	307	7.2	39
5-May	10	3	7	0	10	2.7	422	36.9	10	315	7.9	10
	11	10	1	0	11	2.9	437	36.8	11	317	8.2	11
	12	0	2	0	2	0.5	498	32.5	2	326	4.9	2
	13	4	0	0	4	1.1	426	46.0	4	326	6.1	4
	14	0	1	0	1	0.3	392		1	306		1
	15	1	2	0	3	0.8	499	69.8	3	335	6.6	3
	16											
	17											
Sample Total		207	168	0	375	100.0	275	83.0	375	273	23.0	375

-Continued-

Appendix B.1. (page 2 of 3)

Sample Dates	Age	Sex (number)				Percent of Total	Weight			Length		
		Male	Female	Unknown	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
6-May	4	7	3	0	10	2.6	169	19.2	10	238	4.0	10
	5	90	93	0	183	46.8	208	25.2	183	252	7.4	183
	6	70	66	0	136	34.8	254	29.1	136	267	8.6	136
	7	5	5	0	10	2.6	309	21.1	10	286	6.4	10
	8	3	3	0	6	1.5	346	50.8	6	295	11.0	6
	9	15	11	0	26	6.6	384	32.1	26	304	5.7	26
	10	1	6	0	7	1.8	439	27.3	7	317	3.3	7
	11	3	0	0	3	0.8	431	24.6	3	314	7.2	3
	12	3	1	0	4	1.0	431	27.5	4	317	8.4	4
	13	1	0	0	1	0.3	507		1	331		1
	14	3	0	0	3	0.8	457	21.1	3	318	5.5	3
	15	0	1	0	1	0.3	408		1	336		1
	16											
	17	0	1	0	1	0.3	514		1	348		1
Sample Total		201	190	0	391	100.0	251	71.7	391	266	21.0	391
7-May	4	3	9	0	12	3.1	171	15.9	12	239	1.8	12
	5	85	98	0	183	47.4	207	22.1	183	252	7.5	183
	6	58	71	0	129	33.4	258	31.5	129	269	10.1	129
	7	1	8	0	9	2.3	301	29.2	9	281	9.0	9
	8	12	0	0	12	3.1	349	41.5	12	294	8.4	12
	9	11	12	0	23	6.0	399	46.4	23	306	9.2	23
	10	2	2	0	4	1.0	403	36.1	4	311	8.1	4
	11	5	2	0	7	1.8	440	52.8	7	320	7.9	7
	12	2	2	0	4	1.0	452	46.3	4	322	9.2	4
	13	1	0	0	1	0.3	400		1	322		1
	14											
	15	0	2	0	2	0.5	501	34.6	2	328	2.1	2
	16											
	17											
Sample Total		180	206	0	386	100.0	252	73.0	386	265	21.2	386
8-May	4	3	2	0	5	2.6	185	20.8	5	242	3.9	5
	5	53	55	0	108	56.5	204	23.3	108	250	8.5	108
	6	28	33	0	61	31.9	257	32.7	61	267	9.7	61
	7	2	3	0	5	2.6	296	35.3	5	285	10.3	5
	8											
	9	2	3	0	5	2.6	392	51.9	5	299	10.8	5
	10	2	0	0	2	1.0	399	39.6	2	311	4.9	2
	11	1	2	0	3	1.6	464	82.6	3	321	12.3	3
	12	0	1	0	1	0.5	524		1	334		1
	13											
	14	1	0	0	1	0.5	457		1	331		1
	15											
	16											
	17											
Sample Total		92	99	0	191	100.0	237	64.3	191	260	18.8	191

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Appendix B.1. (page 3 of 3)

Sample Dates	Age	Sex (number)				Percent of Total	Weight			Length		
		Male	Female	Unknown	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
	4	15	16	0	31	1.7	172	18.4	31	239	3.4	31
	5	313	306	0	619	34.9	208	24.8	619	252	7.9	619
	6	295	282	0	577	32.5	259	30.6	577	269	9.2	577
	7	24	33	0	57	3.2	301	30.4	57	282	8.1	57
	8	37	22	0	59	3.3	367	46.1	59	296	10.0	59
	9	94	96	0	190	10.7	411	43.2	190	306	7.9	190
3- 8 May	10	33	35	0	68	3.8	429	47.4	68	312	9.1	68
	11	47	23	0	70	3.9	447	53.9	70	317	9.1	70
	12	18	23	0	41	2.3	471	49.4	41	323	8.8	41
	13	13	13	0	26	1.5	467	49.6	26	321	10.3	26
	14	9	10	0	19	1.1	481	53.9	19	324	8.6	19
	15	6	7	0	13	0.7	500	56.1	13	332	6.7	13
	16	0	3	0	3	0.2	545	19.1	3	339	11.9	3
	17	0	1	0	1	0.1	514		1	348		1
All Samples Combined		904	870	0	1,774	100.0	288	97.9	1,774	275	25.9	1,774
Sex Composition		51.0	49.0									
Unaged		41	35	0	76	4.3	334	99.6	76	285	26.1	76
Sex Composition		53.9	46.1									

Appendix B.2. Age, sex and size composition of Pacific herring caught by commercial purse seine, Hagemeister Section, 5-13 May 2002.

Sample Dates	Age	Sex (number)				Percent of Total	Weight			Length		
		Male	Female	Unknown	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
	4	9	4	0	13	6.6	175	16.9	13	238	5.4	13
	5	32	26	0	58	29.4	214	26.0	58	251	8.6	58
	6	33	33	0	66	33.5	263	33.4	66	267	8.7	66
	7	5	4	0	9	4.6	335	39.1	9	285	3.8	9
	8	4	7	0	11	5.6	375	44.9	11	297	8.3	11
	9	12	9	0	21	10.7	393	47.3	21	305	7.4	21
	10	4	3	0	7	3.6	459	33.9	7	311	11.5	7
5-May	11	3	2	0	5	2.5	421	55.1	5	312	6.7	5
	12	1	0	0	1	0.5	464		1	300		1
	13	1	1	0	2	1.0	472	17.7	2	312	3.5	2
	14	1	3	0	4	2.0	516	25.5	4	329	7.2	4
	15											
	16											
	17											
	18											
Sample Total		105	92	0	197	100.0	286	92.4	197	272	24.9	197
	4	2	0	0	2	0.5	166	12.7	2	238	2.8	2
	5	55	36	0	91	24.3	214	26.3	91	253	8.3	91
	6	63	54	0	117	31.2	262	29.0	117	269	9.0	117
	7	3	5	0	8	2.1	321	27.4	8	288	9.5	8
	8	11	6	0	17	4.5	363	56.8	17	294	10.5	17
	9	31	29	0	60	16.0	404	42.2	60	308	8.5	60
	10	11	16	0	27	7.2	440	41.0	27	313	7.2	27
6-May	11	10	12	0	22	5.9	465	39.7	22	319	8.9	22
	12	7	7	0	14	3.7	462	60.3	14	321	11.2	14
	13	7	5	0	12	3.2	482	52.5	12	327	7.6	12
	14	1	2	0	3	0.8	528	100.7	3	335	8.0	3
	15	0	1	0	1	0.3	564		1	340		1
	16											
	17											
	18	1	0	0	1	0.3	604		1	348		1
Sample Total		202	173	0	375	100.0	321	105.1	375	284	27.7	375
	4	2	3	0	5	2.6	172	17.7	5	238	8.2	5
	5	33	25	0	58	30.7	207	23.2	58	251	7.4	58
	6	45	28	0	73	38.6	257	28.1	73	267	9.0	73
	7	2	4	0	6	3.2	292	39.9	6	279	11.7	6
	8	4	2	0	6	3.2	342	35.1	6	292	10.6	6
	9	7	15	0	22	11.6	406	39.0	22	307	7.4	22
	10	3	3	0	6	3.2	417	45.2	6	310	2.7	6
7-May	11	3	2	0	5	2.6	476	33.4	5	318	7.7	5
	12	2	1	0	3	1.6	415	97.3	3	314	15.4	3
	13	0	3	0	3	1.6	475	38.4	3	324	9.5	3
	14	1	0	0	1	0.5	432		1	321		1
	15											
	16	0	1	0	1	0.5	529		1	348		1
	17											
	18											
Sample Total		102	87	0	189	100.0	280	89.6	189	272	24.9	189

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Appendix B.2. (page 2 of 4)

Sample Dates	Age	Sex (number)				Percent of Total	Weight			Length		
		Male	Female	Unknown	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
	4	10	2	0	12	3.7	174	28.0	12	234	8.3	12
	5	47	30	0	77	23.5	214	23.7	77	248	8.5	77
	6	44	46	0	90	27.5	261	28.9	90	264	7.4	90
	7	9	12	0	21	6.4	312	41.7	21	277	9.1	21
	8	11	12	0	23	7.0	366	48.8	23	289	8.3	23
	9	20	19	0	39	11.9	412	42.4	39	303	6.4	39
	10	10	15	0	25	7.6	436	51.2	25	306	6.8	25
8-May	11	5	8	0	13	4.0	451	58.2	13	314	4.1	13
	12	8	7	0	15	4.6	469	46.3	15	320	8.8	15
	13	1	4	0	5	1.5	479	43.3	5	320	6.5	5
	14	0	3	0	3	0.9	574	78.7	3	323	11.1	3
	15	3	0	0	3	0.9	446	43.0	3	332	8.9	3
	16	0	1	0	1	0.3	581		1	339		1
	17											
	18											
Sample Total		168	159	0	327	100.0	315	104.7	327	276	27.4	327
	4	4	2	0	6	1.6	182	9.9	6	241	5.0	6
	5	54	61	0	115	31.6	207	24.4	115	249	7.9	115
	6	31	54	0	85	23.4	263	32.3	85	267	10.1	85
	7	7	11	0	18	4.9	315	41.8	18	278	10.1	18
	8	12	11	0	23	6.3	333	41.7	23	288	8.1	23
	9	15	26	0	41	11.3	405	43.7	41	303	8.1	41
	10	10	9	0	19	5.2	415	45.8	19	307	6.7	19
9-May	11	10	9	0	19	5.2	430	46.7	19	311	6.4	19
	12	6	13	0	19	5.2	467	54.1	19	319	6.3	19
	13	2	7	0	9	2.5	481	83.4	9	320	14.4	9
	14	2	4	0	6	1.6	480	58.6	6	327	6.3	6
	15	1	2	0	3	0.8	536	6.4	3	331	6.0	3
	16											
	17	0	1	0	1	0.3	546		1	324		1
	18											
Sample Total		154	210	0	364	100.0	306	104.9	364	277	27.6	364
	4	3	2	0	5	1.3	165	6.8	5	232	4.5	5
	5	71	46	0	117	31.1	208	26.8	117	248	7.9	117
	6	46	61	0	107	28.5	256	32.7	107	264	10.2	107
	7	12	8	0	20	5.3	317	32.4	20	281	10.2	20
	8	5	14	0	19	5.1	369	48.8	19	291	5.6	19
	9	22	19	0	41	10.9	391	44.6	41	298	8.1	41
	10	14	10	0	24	6.4	422	36.9	24	306	5.8	24
10-May	11	7	9	0	16	4.3	445	45.7	16	312	5.7	16
	12	6	4	0	10	2.7	453	41.7	10	318	9.2	10
	13	4	4	0	8	2.1	473	20.8	8	318	5.5	8
	14	1	5	0	6	1.6	497	74.0	6	321	7.7	6
	15	1	1	0	2	0.5	493	36.1	2	316	9.2	2
	16	1	0	0	1	0.3	462		1	326		1
	17											
	18											
Sample Total		193	183	0	376	100.0	298	98.8	376	273	26.2	376

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Appendix B.2. (page 3 of 4)

Sample Dates	Age	Sex (number)				Percent of Total	Weight			Length		
		Male	Female	Unknown	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
	4	2	1	0	3	1.6	145	9.8	3	225	6.4	3
	5	38	40	0	78	41.1	207	27.3	78	249	8.6	78
	6	30	27	0	57	30.0	255	32.8	57	265	8.8	57
	7	4	3	0	7	3.7	311	24.3	7	278	9.6	7
	8	5	4	0	9	4.7	336	42.9	9	290	6.0	9
	9	10	7	0	17	8.9	392	52.0	17	299	8.8	17
	10	1	6	0	7	3.7	444	47.2	7	308	4.8	7
11-May	11	3	0	0	3	1.6	415	48.3	3	310	5.5	3
	12	3	3	0	6	3.2	445	74.6	6	314	4.8	6
	13	0	1	0	1	0.5	518		1	328		1
	14	1	0	0	1	0.5	533		1	328		1
	15											
	16											
	17	1	0	0	1	0.5	542		1	334		1
	18											
Sample Total		98	92	0	190	100.0	272	90.8	190	267	23.9	190
	4	3	5	0	8	2.3	172	22.2	8	235	7.7	8
	5	74	87	0	161	46.8	207	26.2	161	250	8.1	161
	6	51	48	0	99	28.8	254	30.1	99	264	8.0	99
	7	4	8	0	12	3.5	273	30.1	12	273	9.9	12
	8	4	5	0	9	2.6	333	51.4	9	288	12.4	9
	9	25	9	0	34	9.9	393	42.5	34	302	8.3	34
	10	5	3	0	8	2.3	418	37.6	8	306	4.9	8
12-May	11	1	2	0	3	0.9	405	17.4	3	312	8.5	3
	12	1	1	0	2	0.6	480	32.5	2	319	4.2	2
	13	2	2	0	4	1.2	496	55.0	4	324	9.3	4
	14	0	1	0	1	0.3	447		1	324		1
	15	1	1	0	2	0.6	435	51.6	2	321	21.2	2
	16	1	0	0	1	0.3	411		1	319		1
	17											
	18											
Sample Total		172	172	0	344	100.0	258	79.7	344	264	22.5	344
	4	1	2	0	3	0.8	170	14.0	3	233	8.5	3
	5	84	75	0	159	43.0	206	25.4	159	250	8.5	159
	6	84	76	0	160	43.2	252	31.4	160	265	8.5	160
	7	3	4	0	7	1.9	314	45.6	7	286	6.3	7
	8	3	3	0	6	1.6	361	23.6	6	294	6.6	6
	9	12	6	0	18	4.9	375	46.7	18	298	8.0	18
	10	3	3	0	6	1.6	391	35.1	6	303	6.9	6
13-May	11	7	2	0	9	2.4	411	57.8	9	316	7.2	9
	12	1	1	0	2	0.5	486	17.7	2	325	3.5	2
	13											
	14											
	15											
	16											
	17											
	18											
Sample Total		198	172	0	370	100.0	248	64.2	370	263	18.8	370

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Appendix B.2. (page 4 of 4)

Sample Dates	Age	Sex (number)				Percent of Total	Weight			Length		
		Male	Female	Unknown	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
5-13 May	4	36	21	0	57	2.1	172	19.5	57	236	7.3	57
	5	488	426	0	914	33.5	209	25.7	914	250	8.3	914
	6	427	427	0	854	31.3	258	31.0	854	266	9.0	854
	7	49	59	0	108	4.0	311	39.0	108	280	9.9	108
	8	59	64	0	123	4.5	355	48.1	123	291	8.8	123
	9	154	139	0	293	10.7	399	44.3	293	303	8.6	293
	10	61	68	0	129	4.7	429	44.2	129	308	7.2	129
	11	49	46	0	95	3.5	442	49.7	95	314	7.4	95
	12	35	37	0	72	2.6	462	53.8	72	319	8.8	72
	13	17	27	0	44	1.6	481	51.0	44	322	9.5	44
	14	7	18	0	25	0.9	506	67.5	25	326	8.0	25
	15	6	5	0	11	0.4	488	56.1	11	327	11.8	11
	16	2	2	0	4	0.1	496	74.6	4	333	13.0	4
	17	1	1	0	2	0.1	544	2.8	2	329	7.1	2
	18	1	0	0	1	0.0	604		1	348		1
All Samples Combined		1,392	1,340	0	2,732	100.0	288	96.8	2,732	272	25.9	2,732
Sex Composition		51.0	49.0									
Unaged		88	123	0	211	7.7	335	106.1	211	284	28.0	211
Sex Composition		41.7	58.3									

Appendix B.3. Age, sex and size composition of Pacific herring caught by commercial purse seine, Pyrite Point Section, 6-11 May 2002.

Sample Dates	Age	Sex (number)				Percent of Total	Weight			Length		
		Male	Female	Unknown	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
	4											
	5	49	44	0	93	25.3	217	26.2	93	252	9.0	93
	6	56	67	0	123	33.5	263	32.9	123	267	9.0	123
	7	9	6	0	15	4.1	301	47.3	15	278	8.8	15
	8	10	9	0	19	5.2	375	42.2	19	294	8.2	19
	9	28	25	0	53	14.4	428	46.6	53	307	8.7	53
6-May	10	12	18	0	30	8.2	438	51.1	30	314	6.7	30
	11	4	8	0	12	3.3	476	52.1	12	325	8.9	12
	12	6	3	0	9	2.5	452	76.0	9	316	11.3	9
	13	5	1	0	6	1.6	463	45.6	6	321	7.7	6
	14	2	3	0	5	1.4	492	61.4	5	329	4.9	5
	15	0	2	0	2	0.5	538	7.1	2	330	5.7	2
	16											
Sample Total		181	186	0	367	100.0	316	102.6	367	280	26.6	367
	4	2	2	0	4	2.1	180	15.0	4	241	2.9	4
	5	25	25	0	50	25.9	215	27.7	50	249	9.0	50
	6	31	35	0	66	34.2	267	33.6	66	266	8.9	66
	7	6	8	0	14	7.3	303	44.9	14	277	11.0	14
	8	4	7	0	11	5.7	397	30.4	11	295	6.8	11
	9	10	15	0	25	13.0	426	44.5	25	303	7.9	25
11-May	10	4	3	0	7	3.6	437	27.1	7	308	3.6	7
	11	2	5	0	7	3.6	457	28.5	7	313	7.7	7
	12	2	2	0	4	2.1	486	22.2	4	318	9.1	4
	13	1	1	0	2	1.0	491	65.1	2	319	5.7	2
	14	1	0	0	1	0.5	452		1	313		1
	15											
	16	0	2	0	2	1.0	529	11.3	2	330	0.7	2
Sample Total		88	105	0	193	100.0	306	97.9	193	274	24.7	193
	4	2	2	0	4	0.7	180	15.0	4	241	2.9	4
	5	74	69	0	143	25.5	216	26.7	143	251	9.0	143
	6	87	102	0	189	33.8	264	33.1	189	267	9.0	189
	7	15	14	0	29	5.2	302	45.3	29	277	9.8	29
	8	14	16	0	30	5.4	383	39.2	30	294	7.7	30
	9	38	40	0	78	13.9	428	45.6	78	305	8.6	78
6-11 May	10	16	21	0	37	6.6	438	47.2	37	313	6.6	37
	11	6	13	0	19	3.4	469	44.9	19	320	10.2	19
	12	8	5	0	13	2.3	462	65.1	13	317	10.3	13
	13	6	2	0	8	1.4	470	47.5	8	320	6.9	8
	14	3	3	0	6	1.1	486	57.3	6	326	7.8	6
	15	0	2	0	2	0.4	538	7.1	2	330	5.7	2
	16	0	2	0	2	0.4	529	11.3	2	330	0.7	2
All Samples Combined		269	291	0	560	100.0	313	101.0	560	278	26.1	560
Sex Composition		48.0	52.0									
Unaged		17	20	0	37	6.6	323	111.7	37	279	29.7	37
Sex Composition		45.9	54.1									

Appendix B.4. Age, sex and size composition of Pacific herring caught by commercial purse seine, Nunavachak, Hagemeister and Pyrite Point Sections combined, 3-13 May 2002.

Sample Dates	Age	Sex (number)				Percent of Total	Weight			Length		
		Male	Female	Unknown	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
3-May	4											
	5	13	6	0	19	6.4	230	20.0	19	259	5.7	19
	6	44	37	0	81	27.2	271	25.8	81	272	9.1	81
	7	4	8	0	12	4.0	310	28.5	12	283	5.7	12
	8	9	10	0	19	6.4	388	32.3	19	300	7.6	19
	9	33	34	0	67	22.5	426	42.4	67	308	8.2	67
	10	19	11	0	30	10.1	424	52.2	30	312	10.0	30
	11	17	14	0	31	10.4	465	48.1	31	319	8.0	31
	12	7	13	0	20	6.7	489	37.8	20	326	7.5	20
	13	3	4	0	7	2.3	471	57.1	7	322	12.7	7
	14	4	3	0	7	2.3	479	30.2	7	329	7.8	7
	15	2	2	0	4	1.3	540	45.4	4	335	8.2	4
	16	0	1	0	1	0.3	565		1	352		1
	17											
	18											
Sample Total		155	143	0	298	100.0	377	96.9	298	298	23.6	298
4-May	4	0	1	0	1	0.8	199		1	242		1
	5	3	1	0	4	3.0	259	35.1	4	260	10.0	4
	6	10	7	0	17	12.8	285	20.6	17	270	6.4	17
	7	4	2	0	6	4.5	302	23.7	6	277	7.2	6
	8	8	2	0	10	7.5	375	35.0	10	290	7.2	10
	9	13	17	0	30	22.6	425	37.2	30	304	7.3	30
	10	6	9	0	15	11.3	452	50.0	15	308	9.7	15
	11	11	4	0	15	11.3	419	65.7	15	310	9.6	15
	12	6	4	0	10	7.5	449	64.1	10	319	10.1	10
	13	4	9	0	13	9.8	480	41.0	13	319	10.6	13
	14	1	6	0	7	5.3	510	70.6	7	323	6.3	7
	15	3	0	0	3	2.3	477	45.9	3	328	6.2	3
	16	0	2	0	2	1.5	535	10.6	2	332	4.2	2
	17											
	18											
Sample Total		69	64	0	133	100.0	408	85.2	133	301	20.8	133
5-May	4	11	5	0	16	2.8	172	16.5	16	238	5.0	16
	5	101	79	0	180	31.5	212	26.2	180	253	8.4	180
	6	118	101	0	219	38.3	258	31.7	219	268	8.5	219
	7	13	11	0	24	4.2	306	43.9	24	281	7.9	24
	8	9	14	0	23	4.0	365	55.0	23	296	11.8	23
	9	32	28	0	60	10.5	399	43.0	60	307	7.3	60
	10	7	10	0	17	3.0	437	39.4	17	313	9.4	17
	11	13	3	0	16	2.8	432	42.1	16	315	7.8	16
	12	1	2	0	3	0.5	487	30.2	3	317	15.1	3
	13	5	1	0	6	1.0	441	43.5	6	321	9.0	6
	14	1	4	0	5	0.9	491	59.7	5	324	11.9	5
	15	1	2	0	3	0.5	499	69.8	3	335	6.6	3
	16											
	17											
	18											
Sample Total		312	260	0	572	100.0	279	86.4	572	273	23.7	572

-Continued-

Appendix B.4. (page 2 of 4)

Sample Dates	Age	Sex (number)				Percent of Total	Weight			Length		
		Male	Female	Unknown	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
	4	9	3	0	12	1.1	168	17.9	12	238	3.7	12
	5	194	173	0	367	32.4	212	26.0	367	252	8.1	367
	6	189	187	0	376	33.2	259	30.6	376	268	8.9	376
	7	17	16	0	33	2.9	308	36.5	33	283	9.2	33
	8	24	18	0	42	3.7	366	49.6	42	294	9.4	42
	9	74	65	0	139	12.3	409	45.1	139	307	8.2	139
	10	24	40	0	64	5.6	439	44.4	64	314	6.6	64
6-May	11	17	20	0	37	3.3	466	43.8	37	321	9.2	37
	12	16	11	0	27	2.4	454	61.7	27	319	10.7	27
	13	13	6	0	19	1.7	477	48.9	19	325	7.9	19
	14	6	5	0	11	1.0	492	66.1	11	328	8.5	11
	15	0	4	0	4	0.4	512	70.5	4	334	5.9	4
	16											
	17	0	1	0	1	0.1	514		1	348		1
	18	1	0	0	1	0.1	604		1	348		1
Sample Total		584	549	0	1,133	100.0	296	99.3	1,133	276	26.4	1,133
	4	5	12	0	17	3.0	171	15.9	17	238	4.4	17
	5	118	123	0	241	41.9	207	22.3	241	252	7.5	241
	6	103	99	0	202	35.1	258	30.3	202	268	9.7	202
	7	3	12	0	15	2.6	297	32.8	15	280	9.8	15
	8	16	2	0	18	3.1	347	38.5	18	294	8.9	18
	9	18	27	0	45	7.8	402	42.6	45	307	8.3	45
	10	5	5	0	10	1.7	411	40.2	10	310	5.1	10
7-May	11	8	4	0	12	2.1	455	47.7	12	319	7.6	12
	12	4	3	0	7	1.2	436	68.0	7	318	11.8	7
	13	1	3	0	4	0.7	457	49.0	4	324	7.9	4
	14	1	0	0	1	0.2	432		1	321		1
	15	0	2	0	2	0.3	501	34.6	2	328	2.1	2
	16	0	1	0	1	0.2	529		1	348		1
	17											
	18											
Sample Total		282	293	0	575	100.0	261	79.9	575	268	22.7	575
	4	13	4	0	17	3.3	177	26.0	17	236	8.1	17
	5	100	85	0	185	35.7	208	23.9	185	250	8.5	185
	6	72	79	0	151	29.2	259	30.4	151	265	8.6	151
	7	11	15	0	26	5.0	309	40.5	26	279	9.6	26
	8	11	12	0	23	4.4	366	48.8	23	289	8.3	23
	9	22	22	0	44	8.5	410	43.4	44	302	7.0	44
	10	12	15	0	27	5.2	433	50.8	27	306	6.7	27
8-May	11	6	10	0	16	3.1	454	60.4	16	315	6.4	16
	12	8	8	0	16	3.1	473	46.8	16	321	9.2	16
	13	1	4	0	5	1.0	479	43.3	5	320	6.5	5
	14	1	3	0	4	0.8	545	87.0	4	325	9.9	4
	15	3	0	0	3	0.6	446	43.0	3	332	8.9	3
	16	0	1	0	1	0.2	581		1	339		1
	17											
	18											
Sample Total		260	258	0	518	100.0	286	99.2	518	270	25.7	518

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Appendix B.4. (page 3 of 4)

Sample Dates	Age	Sex (number)				Percent of Total	Weight			Length		
		Male	Female	Unknown	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
	4	4	2	0	6	1.6	182	9.9	6	241	5.0	6
	5	54	61	0	115	31.6	207	24.4	115	249	7.9	115
	6	31	54	0	85	23.4	263	32.3	85	267	10.1	85
	7	7	11	0	18	4.9	315	41.8	18	278	10.1	18
	8	12	11	0	23	6.3	333	41.7	23	288	8.1	23
	9	15	26	0	41	11.3	405	43.7	41	303	8.1	41
	10	10	9	0	19	5.2	415	45.8	19	307	6.7	19
9-May	11	10	9	0	19	5.2	430	46.7	19	311	6.4	19
	12	6	13	0	19	5.2	467	54.1	19	319	6.3	19
	13	2	7	0	9	2.5	481	83.4	9	320	14.4	9
	14	2	4	0	6	1.6	480	58.6	6	327	6.3	6
	15	1	2	0	3	0.8	536	6.4	3	331	6.0	3
	16											
	17	0	1	0	1	0.3	546		1	324		1
	18											
Sample Total		154	210	0	364	100.0	306	104.9	364	277	27.6	364
	4	3	2	0	5	1.3	165	6.8	5	232	4.5	5
	5	71	46	0	117	31.1	208	26.8	117	248	7.9	117
	6	46	61	0	107	28.5	256	32.7	107	264	10.2	107
	7	12	8	0	20	5.3	317	32.4	20	281	10.2	20
	8	5	14	0	19	5.1	369	48.8	19	291	5.6	19
	9	22	19	0	41	10.9	391	44.6	41	298	8.1	41
	10	14	10	0	24	6.4	422	36.9	24	306	5.8	24
10-May	11	7	9	0	16	4.3	445	45.7	16	312	5.7	16
	12	6	4	0	10	2.7	453	41.7	10	318	9.2	10
	13	4	4	0	8	2.1	473	20.8	8	318	5.5	8
	14	1	5	0	6	1.6	497	74.0	6	321	7.7	6
	15	1	1	0	2	0.5	493	36.1	2	316	9.2	2
	16	1	0	0	1	0.3	462		1	326		1
	17											
	18											
Sample Total		193	183	0	376	100.0	298	98.8	376	273	26.2	376
	4	4	3	0	7	1.8	165	22.1	7	234	9.7	7
	5	63	65	0	128	33.4	210	27.6	128	249	8.7	128
	6	61	62	0	123	32.1	262	33.6	123	265	8.8	123
	7	10	11	0	21	5.5	306	38.8	21	277	10.4	21
	8	9	11	0	20	5.2	370	47.0	20	293	6.9	20
	9	20	22	0	42	11.0	412	50.1	42	301	8.5	42
	10	5	9	0	14	3.7	440	37.2	14	308	4.1	14
11-May	11	5	5	0	10	2.6	444	38.4	10	312	7.0	10
	12	5	5	0	10	2.6	462	60.8	10	315	6.7	10
	13	1	2	0	3	0.8	500	48.6	3	322	6.6	3
	14	2	0	0	2	0.5	493	57.3	2	321	10.6	2
	15											
	16	0	2	0	2	0.5	529	11.3	2	330	0.7	2
	17	1	0	0	1	0.3	542		1	334		1
	18											
Sample Total		186	197	0	383	100.0	289	95.8	383	271	24.5	383

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Appendix B.4. (page 4 of 4)

Sample Dates	Age	Sex (number) Male	Female	Unknown	Total	Percent of Total	Weight Mean (g)	SD	Number Weighed	Length Mean (mm)	SD	Number Measured
	4	3	5	0	8	2.3	172	22.2	8	235	7.7	8
	5	74	87	0	161	46.8	207	26.2	161	250	8.1	161
	6	51	48	0	99	28.8	254	30.1	99	264	8.0	99
	7	4	8	0	12	3.5	273	30.1	12	273	9.9	12
	8	4	5	0	9	2.6	333	51.4	9	288	12.4	9
	9	25	9	0	34	9.9	393	42.5	34	302	8.3	34
	10	5	3	0	8	2.3	418	37.6	8	306	4.9	8
12-May	11	1	2	0	3	0.9	405	17.4	3	312	8.5	3
	12	1	1	0	2	0.6	480	32.5	2	319	4.2	2
	13	2	2	0	4	1.2	496	55.0	4	324	9.3	4
	14	0	1	0	1	0.3	447		1	324		1
	15	1	1	0	2	0.6	435	51.6	2	321	21.2	2
	16	1	0	0	1	0.3	411		1	319		1
	17											
	18											
Sample Total		172	172	0	344	100.0	258	79.7	344	264	22.5	344
	4	1	2	0	3	0.8	170	14.0	3	233	8.5	3
	5	84	75	0	159	43.0	206	25.4	159	250	8.5	159
	6	84	76	0	160	43.2	252	31.4	160	265	8.5	160
	7	3	4	0	7	1.9	314	45.6	7	286	6.3	7
	8	3	3	0	6	1.6	361	23.6	6	294	6.6	6
	9	12	6	0	18	4.9	375	46.7	18	298	8.0	18
	10	3	3	0	6	1.6	391	35.1	6	303	6.9	6
13-May	11	7	2	0	9	2.4	411	57.8	9	316	7.2	9
	12	1	1	0	2	0.5	486	17.7	2	325	3.5	2
	13											
	14											
	15											
	16											
	17											
	18											
Sample Total		198	172	0	370	100.0	248	64.2	370	263	18.8	370
	4	53	39	0	92	1.8	172	18.9	92	237	6.3	92
	5	875	801	0	1,676	33.1	209	25.5	1676	251	8.3	1,676
	6	809	811	0	1,620	32.0	259	31.2	1620	267	9.2	1,620
	7	88	106	0	194	3.8	306	37.8	194	280	9.5	194
	8	110	102	0	212	4.2	362	47.3	212	293	9.2	212
	9	286	275	0	561	11.1	407	45.1	561	305	8.5	561
	10	110	124	0	234	4.6	430	45.5	234	310	8.0	234
3-13 May	11	102	82	0	184	3.6	447	51.2	184	316	8.5	184
	12	61	65	0	126	2.5	465	53.4	126	320	9.2	126
	13	36	42	0	78	1.5	475	50.0	78	322	9.4	78
	14	19	31	0	50	1.0	494	61.4	50	325	8.1	50
	15	12	14	0	26	0.5	498	54.3	26	330	9.2	26
	16	2	7	0	9	0.2	519	52.3	9	334	10.6	9
	17	1	2	0	3	0.1	534	17.4	3	335	12.1	3
	18	1	0	0	1	0.0	604		1	348		1
All Samples Combined		2,565	2,501	0	5,066	100.0	291	97.9	5,066	274	26.0	5,066
Sex Composition		50.6	49.4									
Unaged		146	178	0	324	6.4	333	105.0	324	284	27.7	324
Sex Composition		45.1	54.9									

Appendix B.5. Age, sex and size composition of Pacific herring caught by commercial gillnet, Kulukak Section, 4-13 May 2002.

Sample Dates	Age	Sex (number)				Percent of Total	Weight			Length		
		Male	Female	Unknown	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
	5	0	1	0	1	0.8	254		1	251		1
	6	2	2	0	4	3.4	304	44.1	4	274	8.4	4
	7	5	5	0	10	8.4	335	23.8	10	281	5.3	10
	8	15	3	0	18	15.1	377	30.7	18	293	7.3	18
	9	23	10	0	33	27.7	402	38.0	33	301	8.1	33
	10	9	7	0	16	13.4	417	29.5	16	308	5.7	16
	11	12	3	0	15	12.6	442	41.0	15	311	9.2	15
4-May	12	4	4	0	8	6.7	427	40.5	8	312	8.1	8
	13	2	4	0	6	5.0	448	78.4	6	312	15.2	6
	14	4	2	0	6	5.0	471	45.2	6	317	4.0	6
	15	1	0	0	1	0.8	433		1	324		1
	16	1	0	0	1	0.8	560		1	323		1
	17											
	18											
	19											
	20											
Sample Total		78	41	0	119	100.0	404	56.5	119	301	14.2	119
	5											
	6	0	4	0	4	2.9	319	45.6	4	281	14.4	4
	7	1	2	0	3	2.2	359	28.7	3	294	5.5	3
	8	12	10	0	22	15.8	394	38.6	22	301	9.1	22
	9	16	33	0	49	35.3	436	31.8	49	310	6.5	49
	10	15	13	0	28	20.1	437	30.3	28	313	8.0	28
	11	5	11	0	16	11.5	447	46.7	16	316	11.4	16
5-May	12	6	5	0	11	7.9	467	36.7	11	320	6.3	11
	13	0	1	0	1	0.7	522		1	332		1
	14	2	2	0	4	2.9	461	24.0	4	329	4.0	4
	15	0	1	0	1	0.7	430		1	326		1
	16											
	17											
	18											
	19											
	20											
Sample Total		57	82	0	139	100.0	429	45.7	139	310	11.6	139
	5											
	6											
	7	3	1	0	4	3.0	336	36.5	4	289	3.9	4
	8	3	7	0	10	7.4	400	36.6	10	304	5.9	10
	9	20	38	0	58	43.0	435	34.9	58	309	7.4	58
	10	8	17	0	25	18.5	454	38.9	25	314	6.3	25
	11	10	9	0	19	14.1	447	39.6	19	315	10.3	19
6-May	12	5	4	0	9	6.7	473	47.4	9	324	11.1	9
	13	2	4	0	6	4.4	483	44.5	6	325	8.6	6
	14	2	2	0	4	3.0	473	35.2	4	320	3.7	4
	15											
	16											
	17											
	18											
	19											
	20											
Sample Total		53	82	0	135	100.0	441	45.2	135	312	10.1	135

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Appendix B.5. (page 2 of 4)

Sample Dates	Age	Sex (number)				Percent of Total	Weight			Length		
		Male	Female	Unknown	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
	5											
	6	0	6	0	6	4.4	304	41.1	6	279	10.9	6
	7	1	3	0	4	2.9	347	30.6	4	286	5.6	4
	8	5	13	0	18	13.2	378	40.6	18	299	10.6	18
	9	23	27	0	50	36.8	411	37.9	50	307	8.5	50
	10	10	13	0	23	16.9	418	41.8	23	311	8.6	23
	11	9	10	0	19	14.0	439	36.0	19	317	10.3	19
7-May	12	4	3	0	7	5.1	487	56.7	7	326	8.4	7
	13	2	2	0	4	2.9	504	58.8	4	330	4.0	4
	14	1	3	0	4	2.9	483	74.0	4	331	16.9	4
	15											
	16	1	0	0	1	0.7	521		1	320		1
	17											
	18											
	19											
	20											
Sample Total		56	80	0	136	100.0	415	57.4	136	309	14.4	136
	5	2	0	0	2	1.4	220	30.4	2	255	14.1	2
	6	0	4	0	4	2.9	316	48.6	4	285	11.8	4
	7	3	2	0	5	3.6	345	32.6	5	291	4.7	5
	8	9	8	0	17	12.3	361	24.8	17	297	7.1	17
	9	15	31	0	46	33.3	397	33.6	46	307	7.7	46
	10	7	21	0	28	20.3	417	41.2	28	310	8.3	28
	11	4	9	0	13	9.4	437	34.8	13	315	9.0	13
8-May	12	8	6	0	14	10.1	438	42.2	14	320	8.8	14
	13	1	2	0	3	2.2	438	30.6	3	317	14.6	3
	14	1	3	0	4	2.9	482	40.4	4	327	6.2	4
	15	1	0	0	1	0.7	435		1	329		1
	16	0	1	0	1	0.7	560		1	345		1
	17											
	18											
	19											
	20											
Sample Total		51	87	0	138	100.0	402	54.1	138	308	13.8	138
	5	1	1	0	2	1.5	246	1.4	2	262	2.8	2
	6	2	2	0	4	3.0	309	42.5	4	277	9.7	4
	7	3	5	0	8	6.0	333	40.0	8	282	10.3	8
	8	8	7	0	15	11.3	375	36.0	15	296	4.5	15
	9	36	27	0	63	47.4	407	28.4	63	302	7.6	63
	10	8	10	0	18	13.5	427	38.0	18	311	9.2	18
	11	8	2	0	10	7.5	421	40.5	10	312	6.4	10
9-May	12	1	3	0	4	3.0	455	41.3	4	320	5.9	4
	13	4	1	0	5	3.8	439	27.3	5	317	11.1	5
	14	0	2	0	2	1.5	531	43.8	2	337	6.4	2
	15	1	1	0	2	1.5	448	53.0	2	320	0.7	2
	16											
	17											
	18											
	19											
	20											
Sample Total		72	61	0	133	100.0	402	50.8	133	303	13.6	133

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Appendix B.5. (page 3 of 4)

Sample Dates	Age	Sex (number)				Percent of Total	Weight			Length		
		Male	Female	Unknown	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
	5											
	6	1	2	0	3	2.3	308	4.7	3	269	10.5	3
	7	4	3	0	7	5.3	324	23.8	7	279	4.3	7
	8	9	8	0	17	12.9	387	33.4	17	294	8.9	17
	9	27	25	0	52	39.4	408	30.8	52	301	7.5	52
	10	14	9	0	23	17.4	432	45.0	23	306	8.6	23
	11	7	9	0	16	12.1	454	29.7	16	314	7.4	16
10-May	12	6	2	0	8	6.1	450	47.7	8	315	8.3	8
	13	1	0	0	1	0.8	457		1	320		1
	14	3	1	0	4	3.0	452	62.9	4	319	9.9	4
	15											
	16											
	17											
	18											
	19											
	20	0	1	0	1	0.8	532		1	342		1
Sample Total		72	60	0	132	100.0	414	49.9	132	302	13.1	132
	5	1	2	0	3	2.2	205	11.2	3	250	1.2	3
	6	3	8	0	11	8.1	291	30.6	11	275	5.7	11
	7	2	3	0	5	3.7	304	31.0	5	281	13.4	5
	8	8	13	0	21	15.4	359	24.0	21	292	4.8	21
	9	28	26	0	54	39.7	391	34.1	54	300	7.9	54
	10	5	12	0	17	12.5	421	39.8	17	308	6.3	17
	11	4	6	0	10	7.4	404	32.9	10	310	9.6	10
12-May	12	1	6	0	7	5.1	433	25.3	7	320	5.9	7
	13	2	1	0	3	2.2	423	70.9	3	310	8.7	3
	14	2	2	0	4	2.9	441	33.9	4	319	6.1	4
	15	0	1	0	1	0.7	491		1	324		1
	16											
	17											
	18											
	19											
	20											
Sample Total		56	80	0	136	100.0	381	57.7	136	299	15.2	136
	5											
	6	5	13	0	18	18.2	287	19.6	18	271	6.5	18
	7	8	6	0	14	14.1	307	25.0	14	278	6.7	14
	8	10	5	0	15	15.2	353	24.4	15	290	5.1	15
	9	14	11	0	25	25.3	391	30.3	25	299	6.6	25
	10	4	6	0	10	10.1	408	39.6	10	306	5.2	10
	11	5	3	0	8	8.1	412	56.3	8	312	12.8	8
13-May	12	4	1	0	5	5.1	405	8.1	5	313	9.6	5
	13	2	1	0	3	3.0	422	45.2	3	312	0.6	3
	14											
	15	1	0	0	1	1.0	443		1	336		1
	16											
	17											
	18											
	19											
	20											
Sample Total		53	46	0	99	100.0	360	57.0	99	293	16.7	99

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Sample Dates	Age	Sex (number)				Percent of Total	Weight			Length		
		Male	Female	Unknown	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
4-13 May	5	4	4	0	8	0.7	225	24.3	8	255	7.4	8
	6	13	41	0	54	4.6	298	32.4	54	275	9.2	54
	7	30	30	0	60	5.1	327	31.9	60	283	8.3	60
	8	79	74	0	153	13.1	375	35.0	153	296	8.3	153
	9	202	228	0	430	36.8	410	36.6	430	304	8.4	430
	10	80	108	0	188	16.1	428	40.1	188	310	8.0	188
	11	64	62	0	126	10.8	438	40.9	126	314	9.7	126
	12	39	34	0	73	6.3	450	45.2	73	319	9.0	73
	13	16	16	0	32	2.7	457	56.0	32	318	11.8	32
	14	15	17	0	32	2.7	470	46.8	32	323	9.6	32
	15	4	3	0	7	0.6	447	30.0	7	325	5.8	7
	16	2	1	0	3	0.3	547	22.5	3	329	13.7	3
	17											
	18											
	19											
	20	0	1	0	1	0.1	532		1	342		1
All Samples Combined		548	619	0	1,167	100.0	407	56.9	1,167	304	14.7	1,167
Sex Composition		47.0	53.0									
Unaged		45	52	0	97	8.3	408	57.1	97	306	14.2	97
Sex Composition		46.4	53.6									

Appendix B.6. Age, sex and size composition of Pacific herring caught by test commercial purse seine, Nunavakchak Section, 3-14 May 2002.

Sample Dates	Age	Sex (number)				Percent of Total	Weight			Length		
		Male	Female	Unknown	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
	4											
	5	2	2	0	4	5.8	249	36.6	4	266	16.4	4
	6	8	5	0	13	18.8	299	65.5	13	278	12.4	13
	7	2	3	0	5	7.2	291	60.2	5	278	17.1	5
	8	4	2	0	6	8.7	366	54.5	6	298	8.3	6
3-May	9	12	10	0	22	31.9	414	46.2	22	307	8.7	22
	10	2	1	0	3	4.3	424	41.4	3	310	1.2	3
	11	3	5	0	8	11.6	458	78.7	8	317	10.9	8
	12	3	1	0	4	5.8	474	54.0	4	318	4.8	4
	13	1	0	0	1	1.4	449		1	311		1
	14	0	2	0	2	2.9	522	9.9	2	329	5.7	2
	15	0	1	0	1	1.4	495		1	329		1
Sample Total		37	32	0	69	100.0	383	90.2	69	299	20.2	69
	4	1	1	0	2	1.5	156	19.8	2	233	1.4	2
	5	47	32	0	79	60.3	194	25.2	79	249	9.2	79
	6	28	14	0	42	32.1	229	30.3	42	262	11.2	42
	7											
	8											
13-May	9	2	4	0	6	4.6	365	38.8	6	301	5.1	6
	10	0	1	0	1	0.8	399		1	322		1
	11											
	12	0	1	0	1	0.8	462		1	320		1
	13											
	14											
	15											
Sample Total		78	53	0	131	100.0	217	53.6	131	256	17.4	131
	4	1	0	0	1	0.8	153		1	233		1
	5	28	34	0	62	50.0	200	32.4	62	249	10.5	62
	6	22	30	0	52	41.9	242	29.7	52	263	10.3	52
	7	2	0	0	2	1.6	310	44.5	2	288	7.8	2
	8	1	0	0	1	0.8	302		1	274		1
14-May	9	1	2	0	3	2.4	346	19.9	3	297	10.8	3
	10	1	0	0	1	0.8	366		1	314		1
	11	0	2	0	2	1.6	468	38.9	2	320	15.6	2
	12											
	13											
	14											
	15											
Sample Total		56	68	0	124	100.0	229	55.0	124	259	17.3	124

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Sample Dates	Age	Sex (number)				Percent of Total	Weight			Length		
		Male	Female	Unknown	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
	4	2	1	0	3	0.9	155	14.1	3	233	1.0	3
	5	77	68	0	145	44.8	198	29.9	145	250	10.3	145
	6	58	49	0	107	33.0	244	41.4	107	264	12.0	107
	7	4	3	0	7	2.2	297	53.2	7	281	15.1	7
	8	5	2	0	7	2.2	356	55.2	7	294	11.7	7
3-14 May	9	15	16	0	31	9.6	398	49.4	31	305	8.8	31
	10	3	2	0	5	1.5	408	39.0	5	313	5.1	5
	11	3	7	0	10	3.1	460	70.7	10	318	11.0	10
	12	3	2	0	5	1.5	471	47.1	5	318	4.3	5
	13	1	0	0	1	0.3	449		1	311		1
	14	0	2	0	2	0.6	522	9.9	2	329	5.7	2
	15	0	1	0	1	0.3	495		1	329		1
All Samples Combined		171	153	0	324	100.0	257	91.6	324	266	24.8	324
Sex Composition		52.8	47.2									
Unaged		6	10	0	16	4.9	270	105.5	16	271	28.7	16
Sex Composition		37.5	62.5									

Appendix B.7. Age, sex and size composition of Pacific herring caught by test commercial purse seine, Hagemeister Section, 14 May 2002.

Sample Dates	Age	Sex (number)				Percent of Total	Weight			Length		
		Male	Female	Unknown	Total		Mean (g)	SD	Number Weighed	Mean (mm)	SD	Number Measured
14-May	4	0	1	0	1	0.8	151		1	230		1
	5	33	43	0	76	58.0	200	22.8	76	249	7.2	76
	6	19	24	0	43	32.8	246	23.2	43	264	7.4	43
	7	2	3	0	5	3.8	285	49.9	5	274	14.5	5
	8	0	2	0	2	1.5	359	8.5	2	292	0.7	2
	9	0	2	0	2	1.5	442	16.3	2	306	2.1	2
	10	1	0	0	1	0.8	323		1	301		1
	11	0	1	0	1	0.8	418		1	313		1
All Samples Combined		55	76	0	131	100.0	227	50.9	131	257	14.8	131
Sex Composition		42.0	58.0									
Unaged		2	2	0	4	3.1	232	47.3	4	257	11.9	4
Sex Composition		50.0	50.0									

Appendix B.8. Age, sex and size composition of Pacific herring caught by test commercial purse seine, Hagemeister and Nunavachak Sections combined, 3-14 May 2002.

Sample Dates	Age	Sex (number) Male	Female	Unknown	Total	Percent of Total	Weight Mean (g)	SD	Number Weighed	Length Mean (mm)	SD	Number Measured
	4											
	5	2	2	0	4	5.8	249	36.6	4	266	16.4	4
	6	8	5	0	13	18.8	299	65.5	13	278	12.4	13
	7	2	3	0	5	7.2	291	60.2	5	278	17.1	5
	8	4	2	0	6	8.7	366	54.5	6	298	8.3	6
3-May	9	12	10	0	22	31.9	414	46.2	22	307	8.7	22
	10	2	1	0	3	4.3	424	41.4	3	310	1.2	3
	11	3	5	0	8	11.6	458	78.7	8	317	10.9	8
	12	3	1	0	4	5.8	474	54.0	4	318	4.8	4
	13	1	0	0	1	1.4	449		1	311		1
	14	0	2	0	2	2.9	522	9.9	2	329	5.7	2
	15	0	1	0	1	1.4	495		1	329		1
Sample Total		37	32	0	69	100.0	383	90.2	69	299	20.2	69
	4	1	1	0	2	1.5	156	19.8	2	233	1.4	2
	5	47	32	0	79	60.3	194	25.2	79	249	9.2	79
	6	28	14	0	42	32.1	229	30.3	42	262	11.2	42
	7											
	8											
13-May	9	2	4	0	6	4.6	365	38.8	6	301	5.1	6
	10	0	1	0	1	0.8	399		1	322		1
	11											
	12	0	1	0	1	0.8	462		1	320		1
	13											
	14											
	15											
Sample Total		78	53	0	131	100.0	217	53.6	131	256	17.4	131
	4	1	1	0	2	0.8	152	1.4	2	232	2.1	2
	5	61	77	0	138	54.1	200	27.5	138	249	8.8	138
	6	41	54	0	95	37.3	244	26.9	95	264	9.1	95
	7	4	3	0	7	2.7	292	46.3	7	278	13.9	7
	8	1	2	0	3	1.2	340	33.5	3	286	10.1	3
14-May	9	1	4	0	5	2.0	384	54.9	5	300	9.1	5
	10	2	0	0	2	0.8	345	30.4	2	308	9.2	2
	11	0	3	0	3	1.2	451	39.7	3	318	11.7	3
	12											
	13											
	14											
	15											
Sample Total		111	144	0	255	100.0	228	52.8	255	258	16.0	255
	4	2	2	0	4	0.9	154	11.7	4	232	1.7	4
	5	110	111	0	221	48.6	199	27.7	221	249	9.3	221
	6	77	73	0	150	33.0	244	37.1	150	264	10.8	150
	7	6	6	0	12	2.6	292	49.9	12	278	14.6	12
	8	5	4	0	9	2.0	357	47.9	9	294	10.2	9
3-14 May	9	15	18	0	33	7.3	400	49.1	33	305	8.6	33
	10	4	2	0	6	1.3	394	49.1	6	311	6.8	6
	11	3	8	0	11	2.4	456	68.3	11	317	10.5	11
	12	3	2	0	5	1.1	471	47.1	5	318	4.3	5
	13	1	0	0	1	0.2	449		1	311		1
	14	0	2	0	2	0.4	522	9.9	2	329	5.7	2
	15	0	1	0	1	0.2	495		1	329		1
All Samples Combined		226	229	0	455	100.0	248	83.1	455	264	22.7	455
Sex Composition		49.7	50.3									
Unaged		8	12	0	20	4.4	262	96.9	20	268	26.6	20
Sex Composition		40.0	60.0									

Appendix C.1: 2002 Togiak Herring Forecast

2002 Togiak Herring Forecast

The 2002 herring forecast and harvest allocation is listed below for the Togiak District sac roe fishery and the Dutch Harbor food and bait fishery, given a maximum 20% exploitation rate of the projected run biomass:

Harvest Allocation of the 2002 Forecasted Pacific Herring Run Biomass, Togiak District, Bristol Bay

	Biomass (Short Tons)	Harvest (Short Tons)
Forecasted Biomass for 2002	120,196	
Exploitation @ maximum 20% for Total Allowable Harvest		24,039
Togiak Spawn-on-Kelp Fishery (Fixed Allocation)		1,500
Remaining Allowable Harvest		22,539
Dutch Harbor Food/Bait Allocation (7.0% of the remaining allocation)		1,578
Remaining Allowable Harvest for Togiak District Sac Roe Fishery:		20,961
Purse Seine Allocation 70.0%		14,673
Gill Net Allocation 30.0%		6,288

Age-structured analysis (ASA) has been used since 1993 to forecast the Togiak herring population. This methodology estimates population abundance using age composition data in conjunction with biomass estimates selected from the best aerial survey years.

The forecasted herring biomass for the Togiak District in 2002 is 120,196 tons. Returns for the 1993, 1996, and 1997 year classes (ages-9,-6, and-5, respectively) are expected to comprise 58% of the biomass or 63% of the abundance in numbers of fish (Figure 1). The forecasted average weight is 292g.

The recommended total allowable harvest for the 2002 herring season is 24,039 tons. In accordance with the Bristol Bay Management Plan (5 AAC 27.865), the 2002 harvest allocation is 1,500 tons to the Togiak District spawn on kelp fishery; 1,578 tons to the Dutch Harbor food and bait fishery; and 20,961 tons to the Togiak District sac roe fishery.

In 2001, herring were first observed on April 26, when 638 tons were documented in Kulukak, Togiak, and Hagemeister sections but inclement weather prevented an accurate biomass estimate prior to the start of the commercial fishery on May 6. Management staff based their determination that the threshold biomass of 35,000 tons was on the spawning grounds on levels of biomass observed since April 26, the amount of spawn documented, and the age composition of test fish samples through May 5. The peak

biomass estimate of 67,244 tons was observed on May 15. The last survey conducted on May 29, observed an estimated 21,635 tons of herring on the grounds.

The postseason revised estimate for the 2001 herring biomass was 146,209 tons. This is the sum of the threshold biomass of 35,000 tons, a commercial harvest of 22,330 tons, a peak biomass estimate of 67,244 on May 15 after the fishery, and an aerial survey estimate of 21,635 observed on May 29. Commercial catch and test fish samples spanned from age-4 to age-18. Herring age-9 and older encompassed 39% of the biomass and 27% of the abundance. The 1993 year class returning as age-8 was the largest year class and represented 27% of the biomass and 23% of the abundance. The 1996 and 1997 year classes returning as age-5 and age-4 herring represented 25% of the biomass and 40% of the abundance. A major change in age composition from older to younger herring was observed in the commercial purse seine samples beginning May 10.

Abundance of the Togiak herring spawning population has been monitored since the late 1970's, concurrent to the development of the sac-roe fishery. Peak abundance was observed during the 1982 and 1983 seasons with recruitment of the large age-5 and age-6 year classes from brood years 1977 and 1978 into the spawning biomass. The 1977 and 1978 year classes dwarfed the magnitude of subsequent year classes. Modest recruitment events were evident for the 1987 and 1988 year classes. Current data suggests that the Togiak herring population is stable or moderately declining.

Frederick West
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Anchorage

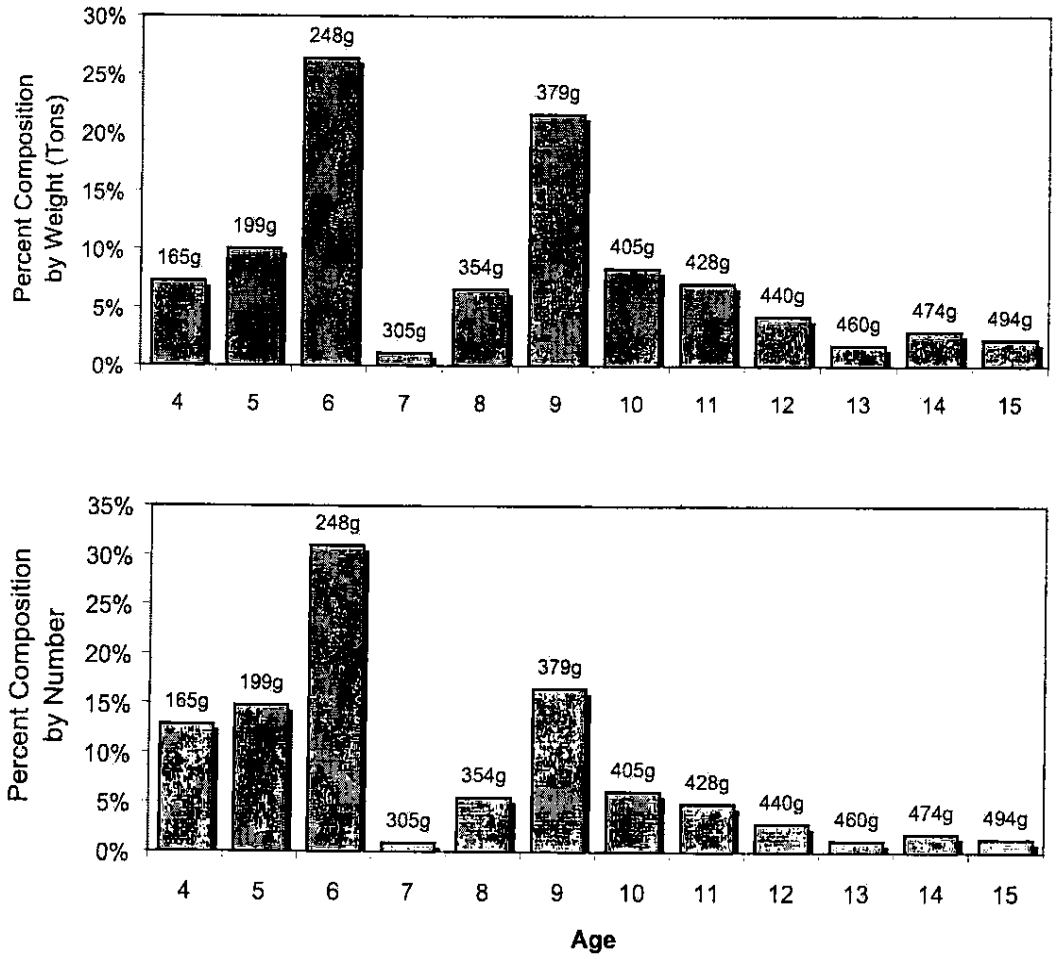

Figure 1. Forecasted age composition by weight (top) and number (bottom) for the 2002 Togiak herring return. Forecasted average weight (grams) by age is also presented.